DOCUMENT RESUME

ED 369 659 SO 022 787

AUTHOR	Chapman, Anne W.
TITLE	The Origins and Development of the National Training Center, 1976-1984. TRADOC Historical Monograph Series.
INSTITUTION	Army Training and Doctrine Command, Fort Monroe, VA. Office of the Command Historian.
PUB DATE	92
NOTE	193p.
PUB TYPE	Historical Materials (060) -- Reports - Descriptive (141)
EDRS PRICE	MF01/PC08 Plus Postage.
DESCRIPTORS	*Armed Forces; *Federal Government; Military Personnel; *Military Training; Postsecondary Education; *Simulation; Site Analysis; *Site Development; Site Selection; Skill Development; Team Training; Training Methods; Training Objectives; United States History; War
IDENTIFIERS	Military History; *United States National Training Center CA

ABSTRACT

Focusing on the development of the United States Army's National Training Center (NTC) from conceptualization and initial implementation in 1981 to the end of the first phase of development in 1984, this monograph provides a documented historical analysis of how and why the landmark event in army training was launched and examines attendant policy issues, funding, instrumentation, and training problems involved in bringing the project from conception to reality. Soldiers stationed in the continental United States trained for war at the NTC at Fort Irwin, California in a setting as close as possible to the reality of combat. Chapters 1-4 focus on the initial conceptualization, the choice of Fort Irwin, and the early problems. Descriptions of the training evaluation and instrumentation system utilized at the Center precede explanations of the NTC experience and are detailed in chapters 5 and 6. Chapter 7 presents information on the lessons learned, and chapter 8 describes the United States Air Force presence at the National Training Center. Charts, tables, maps, and photographs support the information in the text and provide further detail. By 1984 the National Training Center appeared to reach a break-even point between what had been an excellent but unproven concept in the mid 1970s to the reality of a facility that, by the close of 1984, offered the best possible training short of war. A majority of the combat troops in operations Desert Storm and Desert Shield gained experience in desert warfare at the NTC. A list of military acronyms and abbreviations appear at the end of the document. (CK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 369 659

TRADOC Historical Monograph Series

THE ORIGINS AND DEVELOPMENT OF THE NATIONAL TRAINING CENTER 1976 - 1984

by Anne W. Chapman

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

H. O. MALONE

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

So 022 781

Office of the Command Historian
United States Army Training and Doctrine Command

TRADOC Historical Monograph Series

THE ORIGINS AND DEVELOPMENT OF THE NATIONAL TRAINING CENTER 1976 - 1984

by
Anne W. Chapman

Office of the Command Historian
United States Army Training and Doctrine Command
Fort Monroe, Virginia

1992

U.S. ARMY TRAINING AND DOCTRINE COMMAND

General Frederick M. Franks, Jr.	Commander
Major General Donald M. Lionetti	Chief of Staff
Dr. Henry O. Malone, Jr.	Chief Historian
Mr. John L. Romjue	Chief, Historical Studies and Publication

TRADOC HISTORICAL MONOGRAPH SERIES

Henry O. Malone and John L. Romjue, General Editors

TRADOC Historical Monographs are published by the Office of the Command Historian, U.S. Army Training and Doctrine Command. These studies of training and leader development, and doctrinal and combat developments subjects provide historical perspective to support the Command's mission of preparing the Army for war and charting its future.

Library of Congress Cataloging-in-Publication Data

Chapman, Anne W.

The origins and development of the National Training Center, 1976-1984 / by Anne W. Chapman.

p. cm. — (TRADOC historical monograph series)

Includes bibliographical references and index.

1. United States. Dept. of the Army. National Training Center—History. 2. United States. Army—Maneuvers—History—20th century. I. Title. II. Series.

UA26.F665C43 1992

355.5'0973—dc20 92-12450

CIP

5

Table of Contents

Foreword ix

Author's Preface xi

Introduction 1

Chapter I - Roots of the Concept 5

The Training Problem 6

Historical Currents 8

Chapter II - Concept Development and Approval 13

Background 13

Toward Establishment of an NTC or NTCs 18

Chapter III - The Choice of Fort Irwin 25

The Site Selection Process 25

The Environmental Impact Statement 30

Chapter IV - Ironing Out the Early Problems 33

The Question of Responsibility 33

Funding and Budgets 37

"Start-up" Difficulties 41

Chapter V - Training Evaluation and the Instrumentation System 57

Development, Testing, and Delivery 57

The Instrumentation System Design 63

The Multiple Integrated Laser Engagement System 68

Observer-Controllers 71

The Live-fire Range 73

The Indirect Fire Problem 75

Chapter VI - The NTC Experience 81

Preparation and Deployment 81

The Training Program 84

The Opposing Force 85

Instrumented Force-on-Force Maneuvers 90

Live Fire Exercises 98

After Action Reviews and Take Home Packages 101
NTC Observations 106

Chapter VII - Data Analysis and Lessons Learned 111
The Early Difficulties of NTC Lesson Learning 111
The Question of Reliability 116
Dissemination of Lessons Learned 118
Toward a More Responsive System 120

Chapter VIII - The United States Air Force at the NTC 129
Establishing a Program for NTC Air Support 129
The Air Force Presence at Fort Irwin: The Early Difficulties 133
A Laser Engagement System for the Air Force? 135

Conclusion 141

Epilogue 145
List of Acronyms and Abbreviations 149
Selected Bibliography 153
Index 159

Charts

1. Battlefield Operating Systems 58
2. National Training Center Development Implementation Strategy 59
3. National Training Center Instrumentation System 65
4. National Training Center Position Location System 67
5. National Training Center Live Fire System Range Control Unit 76
6. Organization of Training Analysis and Feedback Task Force Analyst Unit 92
7. NTC Operations Center Graphics Display 94
8. Live-Fire Defense Facility 99
9. Live-Fire Offense Facility 100
10. After Action Review Chart 104

Tables

1. National Training Center Organization 35
2. National Training Center Final Planning Organization 42

3. NTC Primary Staff 43
4. NTC Major Units 45
5. NTC TRADOC Operations Group, Early Organization 1982-1984 46
6. National Training Center, IA Functional Structure 61
7. National Training Center Phase I Instrumentation System Hierarchy 64

Maps

1. Fort Irwin and Associated Installations 27
2. Fort Irwin Artillery Impact Areas 29

Photograph sections follow pages 32, 80, and 110. All illustrations are U.S. Army photographs. Courtesy *Army Trainer* magazine, Army Training Support Center and Public Affairs Office, Headquarters Army Training and Doctrine Command.

Cover Photo: An OPFOR (Opposing Forces) column heads for battle in vehicles visually modified to portray Soviet tanks.

FOREWORD

Few developments in Army training have been of such broad scope and long-term significance as the National Training Center (NTC), established in October 1980 at Fort Irwin in the Mojave Desert of California. This instrumented training facility, for armor and mechanized infantry battalions of Army divisions based in the United States, represented a major and unprecedented initiative in bringing realistic simulated-fire, force-on-force training to the battalion level. The NTC thus served the country well in helping to produce a ready fighting force for the deserts of Southwest Asia in early 1991.

This monograph, prepared by Dr. Anne W. Chapman, Research Historian in the Office of the Command Historian, surveys the TRADOC role in the development of the National Training Center from its origin in the 1976 concept through the end of the first phase of operation in 1984. It provides a documented historical analysis of how and why such a landmark event in Army training was launched, examining attendant policy issues, funding, instrumentation, and training problems involved in bringing the project from concept to reality. The work also furnishes a record of how a major defense project was brought on line, making it valuable as a case study.

HENRY O. MALONE, JR., Ph.D.
Chief Historian

Training and Doctrine Command

The Author

Anne West Chapman, a native of Altavista, Virginia, received the A.B., M.A. and Ph.D. degrees in History from the College of William and Mary at Williamsburg, Virginia. Dr. Chapman taught for several school systems in the State of Virginia and at the College of William and Mary before entering Federal Civil Service in 1986. Since then she has served as a Research Historian in the Office of the Command Historian at Headquarters, US Army Training and Doctrine Command. She writes the training chapters in TRADOC's annual command history and prepares historical studies and monographs on the subject of Army training. Dr. Chapman is the author of *The Army's Training Revolution 1973-1990 - An Overview*. She has also written articles and reviews for several journals and contributed essays to the *Dictionary of Literary Biography*.

AUTHOR'S PREFACE

Much has been written and said about the U.S. Army's National Training Center (NTC) at Fort Irwin, California. The huge desert training area with its "Star Wars" instrumentation has been the subject of both popular articles and scholarly studies. The television medium has brought to the public, both at home and abroad, pictures of United States Army troops conducting maneuvers in the sand. Interest in the NTC increased dramatically when the United States began deploying troops to the Saudi Arabian desert in August 1990. The author's own interest in the subject began five years ago as a result of the necessity to cover developments at the NTC as a part of the U.S. Army Training and Doctrine Command's (TRADOC) Annual Historical Review. At that time, the fascination with the desert training center lay in the "high tech" game of cowboys and Indians played there. Over time, however, it became clear that it matters very much how soldiers and leaders are trained and that the Army is deadly serious in its commitment to train units as they will have to fight. As this project began more than three years ago, it was not possible to know that the relevancy of the training at the NTC would be greatly heightened by the crisis in the Persian Gulf. That situation, too, has placed the training offered at Fort Irwin in a different light. Given all this, and the fact that the concept and development of the NTC remains controversial, it seemed important that the story of the training center's evolution from concept to reality be recorded.

Even though the NTC is a joint TRADOC and Forces Command (FORSCOM) effort, this study is based primarily on TRADOC sources and focuses on that command's role in the establishment of the training center at Fort Irwin. FORSCOM activities are examined in detail only insofar as they affected TRADOC's decisions and actions. Most of the primary sources cited herein are located in the TRADOC Historical Research Collection at Fort Monroe, Virginia or at the U.S. Army Combined Arms Center at Fort Leavenworth, Kansas, TRADOC's major subordinate command.

A large debt is owed to many people who believed in this project and offered help and encouragement. The historians on the staff of the Headquarters, U.S. Army Training and Doctrine Command, Office of the Command Historian, have patiently shared moments of enthusiasm and periods of discouragement. A special expression of thanks goes to Mr. John L. Romjue, who was never too busy to share his knowledge and experience with a junior colleague. Likewise, the staff of the Office of the Command Historian at the U.S. Army Combined Arms Center offered encouragement and willingly provided source material. Dr. Rodler F. Morris, then a historian on the faculty of the University of North Carolina, generously shared his research on the Joint Readiness Training Center and offered helpful suggestions on matters pertaining to the NTC. The staff of the TRADOC Technical Library was always willing and able to provide whatever support was required. General William R. Richardson, USA Ret., and Lieutenant General Frederic J. Brown III, USA Ret., reviewed the manuscript and offered valuable comments. General Paul F. Gorman, USA Ret., whose concept and dream the NTC was, and Colonel William L. Shackelford, USA Ret., whose dedication did much to make it happen, shared their extensive knowledge of the subject

with me unstintingly. Colonel Shackelford also shared his own unpublished manuscript on the operation of the NTC in its early years. Last, but certainly not least, a special debt of gratitude is owed to Lieutenant Colonel Winn B. McDougal, USA Ret., whose familiarity with Army training, doctrine, force structure, weapons systems, and other equipment helped to compensate for gaps in my own knowledge. He also carefully read and commented on the manuscript, and it is much the better for it. Many other friends and colleagues contributed to the improvement of this study with information and support. Whatever flaws and shortcomings remain are the author's responsibility alone.

Anne W. Chapman, Ph.D
Research Historian

Office of the Command Historian

United States Army
Training and Doctrine Command

October 1991

Major General Paul F. Gorman

INTRODUCTION

No American soldier must ever die in combat because we failed to provide the tough, realistic training demanded by the battlefields of today.

General Carl E. Vuono
Chief of Staff U.S. Army[1]

In October 1981, the first U.S. Army maneuver battalions rotated through the Army's National Training Center (NTC) at Fort Irwin in the high desert of California. Initial efforts to develop the NTC as a central training facility for unit training had been under way for four years. As the pinnacle of the Army's training system, the new unit training center represented the capstone achievement of the "training revolution" that had taken place in the Army since the end of the Vietnam conflict. The changes in the way the Army trained its soldiers and leaders for combat readiness were, in turn, a response to the realization that United States forces would have to "fight outnumbered, and win." The training changes were also a response to the fielding of many new weapons systems and the development of new doctrine.[2]

At the National Training Center, soldiers stationed in the continental United States were trained for war in a setting as close as possible to the reality of combat. Training exercises for armor and mechanized infantry battalion task forces included highly realistic live-fire exercises and force-on-force engagements. The task forces were confronted by an opposing force of superior numbers, all of whom had been schooled in Warsaw Pact doctrine, tactics, and strategy. Task force exercises included combined arms operations of tanks, mechanized infantry, artillery, antitank missiles, air defense, engineers, electronic warfare elements, attack helicopters, support and service elements, and U.S. Air Force close air support. In the vast maneuver space of Fort Irwin, units trained in tactical scenarios which portrayed a European setting and were designed to prepare battalions for critical wartime missions. While training focused on the battalion task force, the brigade also participated by controlling the exercising battalion and its combat support and combat service support elements through simulated command post exercises. Laser-based engagement simulation provided a degree of realism in casualty assessment second only to actual combat. A sophisticated "core" instrumentation system and exercise "observer-controllers" from the Army's Training and Doctrine Command (TRADOC) provided data that could be analyzed and employed to assess a unit's performance and

1 General Vuono's remarks are from his address to the annual meeting of the Association of the United States Army (AUSA), October 1989, as reported in *Army*, December 1989, pp. 45, 52-54.

2 Quotation is from FM 100-5, *Operations*, 1 July 1976, p. 1-2.

the Army's effectiveness across the broad spectrum of its missions. After action reviews were designed to point out to each unit its strengths and weaknesses in carrying out its missions. "Take home packages" provided commanders with guidance in planning for subsequent training at home station. In addition to offering realistic battlefield training, the NTC's secondary mission was to serve as a laboratory for testing the effectiveness of current and emerging doctrine, force structure, organization, materiel systems, and training management approaches.[3]

This study focuses on the development of the NTC from concept to initial implementation and on its early years of operation. The terminal date of late 1984 reflects the fact that by that time the center's first phase of development was essentially complete, and the Department of the Army's senior trainers had declared the NTC a success. Indeed, they considered it such a success, that plans were underway to use the operations at Fort Irwin as a prototype for the development of maneuver combat training centers for light forces and for forces based in Europe. The NTC would also serve as a model for the development of a training program for division and corps commanders and their staffs. In addition, by the end of 1984, the Army had begun taking steps to institutionalize its "lessons learned" system.

A number of questions concerning the development of the NTC as the focal point of the Army's unit training system are addressed herein. Why did the Army commit to the development of a training facility based on a largely untried concept, and one which promised to absorb such a large part of the Army training budget? How did development come to take the direction that it did? What effect has the information gathered and the experience gained during NTC rotations had on training in the Army, the readiness of Army maneuver units, and on the "lessons learned" system? What contributions has the NTC experience made to interservice cooperation? To what extent has the combat training offered at Fort Irwin lived up to the expectations of its planners? The road to the NTC was anything but smooth. In addition to attempting to offer some insights into those questions, this study of the NTC will dwell implicitly, and sometimes explicitly, on the procedures and problems that grew out of the establishment and management of a large defense project. The NTC story also provides a case history of concept development and institutional planning, processes of prime importance to today's Army.

Although questions remain about the effectiveness of the NTC training experience and its long term effect on unit readiness, the NTC features perhaps the most realistic combat training possible in peacetime. In short, the concept of the National Training Center gives real meaning to the key phrase from Field Manual (FM) 100-5 *Operations* (1 July 1976): "the Army must train as it fights." Despite problems that remain to be solved, it is an example of the coming together of modern technology and new combat doctrine to produce the most innovative and imaginative approach to training in United

3 The Opposing Force (OPFOR) program at Fort Irwin did not begin until January 1982. Prior to that time, troops training at the National Training Center organized themselves into units which then executed force-on-force maneuvers against each other.

States Army history. The NTC has also proved, in dollar terms, to be the most costly single Army training initiative in peacetime history. The most important question that remained as the NTC came to the end of its first phase of development was whether the cost of training at the NTC would pay commensurate dividends in the overall readiness of U.S. Army combat forces. That question appears to have been answered by the outstanding performance of United States soldiers and leaders in Operation DESERT STORM early in 1991. Most of the force deployed had trained in the desert at the National Training Center.[4]

4 According to the TRADOC Office of the Chief of Staff for Training, final figures are not available at this time (September 1991) concerning the number of personnel deployed to Saudi Arabia who had trained at the NTC. Training officials were, however confident that "most" had, although not necessarily with the unit with which they deployed.

Chapter I

ROOTS OF THE CONCEPT

Training is rehearsal for battle, and the most difficult aspects of modern battle are time and space.

–Maj. Gen. Paul F. Gorman[1]

The United States Army's readiness to carry out its wartime missions is measured in terms of manpower, materiel, and training. Training is especially critical because it merges organized manpower and materiel resources within an established doctrinal framework to attain levels of performance that can dictate the difference between success and failure in battle. By the mid-1970s there was a consensus within the military services that the Warsaw Pact nations possessed superiority in numbers and rough parity to the United States in technology. The strategic reality that the United States could no longer rely on superior weight of men and material combined with the increased tempo and lethality of the modern battlefield to convince many in the military establishment that the United States was in a disadvantageous position. Faced with that situation, a handful of senior Army officials came to believe that the perceived deficit might be substantially offset in a future conflict by a better and different kind of training. At the same time, the Army recognized the inadequacy of its current training programs and facilities to support essential combined arms training by its battalion and brigade level maneuver units. Training at home station for those basic combat organizations was adversely affected by space limitations, a lack of battlefield realism in task force maneuvers, the need for an objective means of evaluating unit performance and readiness, and by cost considerations.[2]

---

1 Maj Gen Gorman, DCST, TRADOC Concept Paper, Toward National Training Centers (NTC) for the U.S. Army, 23 May 77.

2 Army Training Study Report Summary, HQ United States Army Training and Doctrine Command (hereafter cited as TRADOC), 8 Aug 78, pp. 7-14.

The Training Problem

As the Army looked ahead into the 1980s, it concluded that the impact of local training constraints would increase in relation to the training need, as the fielding of new air and ground weapons systems increased the tempo, lethality, and size of the battle arena. Land area that had once been ample for training divisions of approximately 20,000 soldiers threatened to become inadequate for exercising brigades of 2,500 or even battalions of 600. Public and private groups concerned for aviation safety, communications regulation, and environmental protection often operated to further restrict the use of Army reservations for realistic training in close air support, electronic warfare, supporting artillery, and live fire. In any case, few units had the resources to realistically portray an opposing force or to provide control of battalion-size exercises.[3]

Evaluation of training was also a concern. Indeed, the Army considered its inability to measure the effectiveness and efficiency not only of training, but also of combat organization, weapons systems, and doctrine, to be a serious drawback to combat readiness. By the early 1970s, it had become clear to the senior leadership that the "mobilization models" of training employed since World War I did not offer a means of objectively assessing the end results of individual or collective training. In addition, the Army would have to train to be victorious without benefit of the traditional long period of mobilization which had characterized the entry of the United States into all its prior wars. The mobilization models of training had become invalid because they assumed that sufficient time would be available to raise, equip, and train a combat force while the United States remained protected by its ocean barriers. Under that model a small standing army formed a nucleus for the construction of units from a pool of conscripts. Training began at the individual level and progressed through the company level; those units were then combined to form regiments, brigades, divisions, and corps which conducted their own cycle of training. When this process had been completed, units were tested for combat readiness and deployed to combat theaters. The old Army Training Program (ATP) had dictated the subjects to be taught and the number of hours a soldier had to be exposed to training. It had not prescribed the meeting of any specific standards or levels of performance. In short, training had been adapted to mass mobilization whereby vast numbers of soldiers received minimum levels of training. The ATP also was based on the availability of soldiers through a Selective Service System, or draft. After January 1973, no draft existed through which the Army could quickly obtain large pools of conscripts. Instead, an increasing reliance was placed on reserve component units from the U.S. Army Reserve and the Army National Guard.[4]

The turbulence created in unit manning by the rapid turnover of personnel in the Vietnam era had revealed a significant flaw in the ATP system. As historian Russell F. Weigley put it: "Officers and men rotated in and out of formations with a rapidity that was deadly to any chance of a combat unit's

3 (1) Ibid. (2) Maj Gen Paul F. Gorman, Toward National Training Centers (NTC) for the U.S. Army, TRADOC Concept Paper, 23 May 77, p. 1

4 FM 100-5, *Operations*, Department of the Army, Washington, D.C., 1 July 1976, p. 1-4.

accumulating insights into the enemy and his country, or to cohesiveness within companies, platoons and even squads." Under those circumstances, standards could not be maintained in an orderly cycle, and unit readiness suffered. That experience, combined with the need to maintain forces at peak readiness levels at all times, gave birth by 1975 to a new performance-oriented Army Training and Evaluation Program (ARTEP). The "revolution in training" that the ARTEP represented was primarily the work of General William E. DePuy, first commander of the U.S. Army Training and Doctrine Command (TRADOC), and his Deputy Chief of Staff for Training, Maj. Gen. Paul F. Gorman, Jr. Gorman was also responsible, at TRADOC, for the articulation of the concepts of advanced training simulation and simulator development. Beginning in 1973, DePuy's vision and Gorman's philosophy of training changed how the Army viewed training, and how it trained soldiers and leaders in training institutions and in units. Specifically, Gorman sought to forge better linkages between the Army's training institutions and its line units. While training in TRADOC's schools had become increasingly sophisticated, training in units lagged far behind in that regard.[5]

The new program for collective training in units had been conceived during General Gorman's tenure as President of the Board for Dynamic Training at Fort Benning (1970-1971). When Gorman reported to TRADOC in October 1973, he brought with him a number of officers who had served with him at Fort Benning and who shared his new concepts of what the Army's training program ought to be. General William C. Westmoreland had established the Board to study training in the Continental Army Command (CONARC), with an eye to reemphasis of the need for innovative approaches to training. The Board found that training in units was intrinsically different from training in institutions. Specifically, training in units had not benefited from the recent technological advances made in school training, despite the fact that soldiers spent most of their time in units.[6]

Responsibility for the actual development of the ARTEP fell to the Combat Arms Training Board, successor to the Board for Dynamic Training. Using a program developed at the Infantry School at Fort Benning as a model, ARTEPs were developed for use in unit training throughout the Army. The performance-oriented system required the soldier to perform to a standard, not just put in the training

---

5 (1) Ltr, General (Ret) Paul F. Gorman to the author 5 Aug 90. (2) Russell F. Weigley, *History of the United States Army*, enlarged edition (Indiana University Press, 1984), quotation on p. 565. General DePuy served as TRADOC commander from July 1973 to June 1977. General Gorman joined him at TRADOC in October 1973 and remained there until 1977. General Gorman's title when he first assumed the position at TRADOC was Deputy Chief of Staff for Training and Schools (DCSTS). Shortly after he arrived at Fort Monroe the title was changed to "Deputy Chief of Staff for Training." Gorman is often described as the "father of the NTC" and of the Army's new training system.

6 The U.S. Continental Army Command's Board for Dynamic Training had been established in September 1971 by General William C. Westmoreland, Army Chief of Staff, to conduct a survey of training in CONARC and to visit Active Army and Reserve Component combat arms units to identify problems in the areas of training techniques, training devices, and training management. CONARC/ARRED Annual Historical Summary, FY 1972, p. 388. (SECRET — Information used is UNCLASSIFIED) The Continental Army Command, established in 1955 was reorganized in 1973 to form two separate commands, the Training and Doctrine Command (TRADOC) headquartered at Fort Monroe, Virginia, and Forces Command (FORSCOM) headquartered at Fort McPherson, Georgia. TRADOC also assumed the combat developments function at that time upon the disestablishment of the Combat Developments Command, which had been headquartered at Fort Belvoir, Virginia.

hours. The ARTEP systematically defined the tasks that combat units, from squad through battalion task force, had to be able to perform, the conditions under which they had to be performed, and the standards which had to be met by a unit for success in combat. It also decentralized training by placing that responsibility directly on the unit. Based on a train-evaluate-train concept, the program was structured to allow Army troops to train as they would fight, evaluate the results of their training, and use the lessons learned to improve training. When the new system was implemented, however, it also proved to have problems. The evaluation of unit performance to Army standards was dependent on the subjective judgment of observers. Units training at home station according to the ARTEP could not provide sufficient resources for training and evaluating large units, a situation which often resulted in battalion and brigade level units not being trained as an entity. Few units could field an opposing force to provide realism to the training. Even those who could, were unable to attain force ratios such as those they would likely face against a Warsaw Pact enemy force. What was needed was highly realistic post-ARTEP battlefield training to bridge the gap between peacetime training and combat, and a data collection and analysis system to allow a more objective assessment of training effectiveness.[7]

Historical Currents

The growing realization of the inadequacy of current Army training facilities and the urgent need for enhanced realism and for an improved means of evaluation was superimposed on a favorable political climate. The coming together of a number of factors in the late 1970s created an atmosphere that made many influential leaders—both military and civilian—receptive to such a costly and ambitious defense project as a national training center. The truce in the Vietnam conflict, which took effect in January 1973, left the U.S. Army demoralized. The manner in which the war had been fought generated profound misgivings about the possible erosion of the Army's tactical, operational, and strategic skills. Also, the demands of Vietnam had left the U.S. Army in Germany severely undermanned and ill-supplied. At the same time, the U.S. Army, Europe faced a massive Soviet conventional arms buildup and force modernization effort that had increased steadily since the Cuban missile crisis in 1962.

Beginning in late 1973, top Army officials watched and analyzed the Arab-Israeli Yom Kippur War carefully for whatever lessons United States forces could learn about the modern battlefield and military doctrine. Armored warfare proved to be still viable and effective. But for many observers, military and civilian, the war brought undeniable evidence of the much advanced lethality and effectiveness of modern weapons. Perhaps the greatest lesson learned from the Middle East conflict was that the superiority of the Israelis' training and tactical doctrine allowed them to fight

7 (1) Briefing, National Training Center, TRADOC to the Vice Chief of Staff, Army, 10 Feb 78 [hereafter cited as TRADOC Briefing, 10 Feb 78]. (2) Romie L. Brownlee and William J. Mullen III, *Changing an Army: An Oral History of General William E. DePuy, USA Retired* (United States Army Military History Institute, Carlisle Barracks, Penn.) pp. 184, 202. (3) Interview by Dr. Brooks Kleber with General Paul F. Gorman, 14 Nov 74.

outnumbered and win. It was clear that U.S. Army doctrine, weapons, and training needed revision, and that the equipping and training of U.S. forces stationed in Korea and Germany had to receive high priority.

As improvement came overseas, units in the United States did not fare as well. In a period of severely limited Army budgets, forces stationed in the continental United States were last in line to receive personnel, funds, and facilities. While the Seventh Army in Germany had well-established ranges and training centers like Grafenwoehr, the Army in the United States had relatively few such facilities to accommodate its growing number of maneuver units. That situation was exacerbated by an increased emphasis on readiness of the reserve components. If U.S. Army troops were to "train as they would fight," the Army's senior trainers had to find a means of coming to terms with the vastness of the late twentieth century battlefield and the training demands of modern weapons systems.

Another result of the 1973 Arab-Israeli War was that the U.S. Army began to take a harder look at the status of its weapons systems and its fighting doctrine. Under General DePuy's leadership, the Army's new Training and Doctrine Command promoted research, development, testing, and engineering programs for a much-needed new generation of weapons and equipment. In 1975, the restructuring of the Army Materiel Command to form the Army Materiel Development and Readiness Command (DARCOM) signaled, in the words of historian Russell E. Weigley, "a new emphasis on research and development to acquire new weapons, an area that had suffered considerable neglect while the Army was preoccupied with fighting in Vietnam." With one of the most comprehensive modernization efforts in Army history under way, and with the introduction of new school curricula and training literature, it was apparent that the Army required a modernized conception of how it would fight. In 1974, DePuy began work on a new doctrine for tactical action, which was published in 1976 as Field Manual (FM) 100-5, *Operations*. Among other things, FM 100-5 put a premium on the realistic training in combined arms warfare that would enable the Army to win its "first battle of the next war" against numerically unfavorable odds. As the new manual's authors put it, "training development must provide training standards and techniques matched closely to the realities of the modern battlefield." Training had to be developed to enable the force to absorb and apply the new weapons systems and the new doctrine. The dependence of readiness on close interaction between combat, doctrinal, and training development was stated with clarity:

> *Since combat developments and doctrine are dynamic, since weapon systems are constantly evolving, and since tactics and techniques are continually changing, training methods must change apace. Readiness for modern battle means training aimed at payoff now. Constant readiness for the early battles changes the presumptions previously governing the US Army training: post mobilization training, annual cycles, cadre development, and the like.*

In addition, FM 100-5, which so decisively bore General DePuy's personal stamp, clearly stated that "collective training in units should aim at maximum effectiveness with combined arms," and training

had to "simulate the modern battlefield." Both DePuy and Gorman saw training simulation as a low cost means of achieving readiness for a peacetime Army. Thus, FM 100-5 provided a sound doctrinal basis for the development of new and innovative training systems.[8]

Although Generals DePuy and Gorman could not have counted on it in the early phases of NTC development, an increase in the defense budget played an important role in allowing such a project to go ahead. In the early post-Vietnam efforts (1975-1977) to solve the problems of training a modern Army, training developers worked against a background of shrinking defense resources. That situation brought two primary, and conflicting, pressures to bear on the Army and its training community. First, there was the conviction of presidential candidate Jimmy Carter that the service training establishments were wasteful and therefore a potential source of significant savings. In the summer of 1976, that position was written into the Democratic Party Platform. Second was the demand for readdressal of the advantages of military training and other Department of Defense activities in New England, New York, and New Jersey by a group of Congressmen representing constituents whose jobs were threatened by suggestions that bases could be more inexpensively operated if they were removed to "Sun Belt" locations. The simple fact was that base operations consumed 60 percent of TRADOC's installation funds and that schools and training centers in the Northeast were significantly more expensive per trainee than elsewhere. If moving bases to the South and West proved politically unfeasible, the Army's ability to address demands for savings in its training programs was greatly reduced. That situation was somewhat alleviated when powerful members of Congress insisted on, and got, a substantially larger defense budget. The Army's share of the budget rose from $21.6 billion in fiscal year 1975 to $34.6 billion in fiscal year 1980.[9]

Thus, by the fall of 1976, the notion of a national training center or centers—which had already been discussed informally at high levels—had taken on significant validity. The experiences of the Vietnam conflict had revealed the need for new approaches to training, weapons development, and warfighting doctrine. Cognizant of the Soviet weapons advantage and impressed by the success of sophisticated weaponry in the Arab-Israeli War, the Army had initiated the most ambitious materiel development and modernization program in its history. Meanwhile, the new Army Training and Evaluation Program for collective training in units had revealed the need for more realism in collective training and a more objective means of evaluating the results of training in units. The

---

8 (1) John L. Romjue, *From Active Defense to Airland Battle: The Development of Army Doctrine, 1973-1982*, TRADOC Historical Monograph Series, ed. Henry O. Malone, Jr. (Fort Monroe, Virginia: Historical Office, TRADOC, June 1984), p. 2. (2) Weigley, *History of the United States Army*, quotation on p. 576. (3) Major Paul H. Herbert, *Deciding What Has to Be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations*, Leavenworth Papers, No. 16 (Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, July 1988), pp. 26-29. (4) FM 100-5, *Operations*, July 1976, quotations on p. 1-4. In 1982 the Army published a radically revamped FM 100-5 in which the new configuration of fundamental tactical principles was termed "AirLand Battle." AirLand Battle doctrine shifted the focus from active defense to agressive maneuver designed to capture and hold the initiative. Minor revisions were made to FM 100-5 in 1986.

9 (1) Ltr, General (Ret) Paul F. Gorman to the author, 23 December 1990. (2) Department of the Army Historical Summary, FY 1975 (Washington, D.C.: Center of Military History, United States Army), p. 70, and FY 1980, p. 169. Amounts shown are dollar value by respective fiscal year.

"active defense" doctrine so recently set forth in FM 100-5 had provided a sound basis for more realistic training as well as for greater dependence on training simulation. Lastly, technology to support more sophisticated simulation was rapidly reaching the field. All those forces came together late in 1976, to create an atmosphere favorable to the development of a training center or centers devoted to training large units in a realistic battlefield environment.

Chapter II

CONCEPT DEVELOPMENT AND APPROVAL

For every day of training in peacetime, we may save weeks and months of war.

—Secretary of War Robert P. Patterson[1]

Background

Against the military and political background of the mid-1970s was born the concept of a training facility (or facilities) where Army battalion-sized units could engage an opposing force in a realistic battlefield environment. As early as 1972, General Gorman, then director of the Board for Dynamic Training, began thinking about a training format that could help the Army to overcome a lack of adequate training ranges. By 1974, some senior Army commanders, especially Generals DePuy and Gorman, began to discuss the need for large centralized training facilities and ways of training units which would involve laser based tactical engagement simulation. While commander of the U.S. Army Forces Command (FORSCOM), 1974-1976, General Bernard W. Rogers went to the U.S. Army Training and Doctrine Command (TRADOC) commander General William E. DePuy to ask his advice and cooperation in resolving the critical shortage of land for training. As a former Chief of Legislative Liaison, Rogers was keenly aware of the political price the Army paid every time it asked Congress to provide land. However, he was also fully appreciative of the need to provide adequate training programs for the new weapons systems being fielded. He suggested to General DePuy that perhaps the Army ought to take one or more areas in the United States, designate it a

1 *Military Review*, July 1949, p. 33, as cited in *Selected Quotations: U.S. Military Leaders*, Office of the Chief of Military History, Department of the Army, Washington, D.C., 3 Feb 64, p. 58.

central range area, and build all land acquisition around it. For instance, Rogers said, the Army could acquire more land around Fort Drum in upstate New York on the grounds that it was European-type terrain and was mainly federally-owned anyway.[2]

In November 1976, Maj. Gen. Paul F. Gorman, Deputy Chief of Staff for Training at TRADOC headquarters and chief agent for transforming General DePuy's visions of a "training revolution" into concrete programs, introduced the concept of large training areas where realistic battlefield conditions could be simulated. Articulation of such a concept was the result of General Rogers' request that TRADOC provide a paper on training policy for inclusion in his fiscal year 1978 Posture Statement to Congress in February 1977. Gorman's approach to improving collective training was clearly in line with FM 100-5, the Army's new field manual which stressed that American soldiers had to train as they would fight if U.S. forces were to "win the first battle of the next war." Gorman defined his ideas in a concept paper and in a speech to the Army Tactical Data Systems project managers, both of which he titled "Toward a Combined Arms Training Center." In his address, Gorman responded to a request to TRADOC from Lt. Gen. Edward C. Meyer, Army Deputy Chief of Staff for Operations and Plans (DCSOPS), for advice on what the Army should have in its inventory by way of land for training. Noting that recent requests from Forts Hood, Carson, Lewis, and Riley for additional land for training totaled $2 billion worth of real estate, Gorman pointed out the dimensions of the problem and offered suggestions for a solution. [3]

With the aid of charts and graphs, Gorman examined in depth the changes that modern technology and tactics had brought to training. With regard to weaponry, he pointed out that the density of conventional explosive force that a U.S. Army mechanized division could deliver on enemy targets in thirty minutes had increased from .9 million pounds in World War II to 4.8 million pounds in 1976. While tactical and organizational changes had been dictated by the advent of tactical nuclear weapons during the 1950s and 1960s, the lethality of the conventional battlefield was not yet fully appreciated. Moreover, an upward trend in firepower available from the rear since World War II and the pinpoint accuracy of new precision guided munitions had had a profound effect on tactics. Operations that placed men forward under increasing amounts of "throw weight" meant putting them at ever greater hazard. The result had been tactics that spread out the battle and thus depended on fewer and fewer people in the forward area. Whereas World War I divisions with approximately 27,000 troops had fought on a front of 2 to 6 kilometers, a division in Europe in the mid 1970s, with 40 percent less manpower, could expect to fight across a sector 60 kilometers wide. This lower density of men meant that it took more room to deploy a division. And, as the Army's new weapons systems entered the force, fewer men would be able to control even more land. Furthermore, developments in artillery

---

2 (1) Maj Gen Paul F. Gorman, "Toward a Combined Arms Training Center,"Speech to the PM, ARTADS-TRADOC, Nov 76, [hereafter cited as Gorman, "Combined Arms Training Center" (speech)), Nov 76]. (2) Ltr, General Paul F. Gorman to the author, 14 January 1991, Maj Gen Bernard W. Rogers served as Chief of Legislative Liaison, 1971-72.

3 (1) MG Paul F. Gorman, "Toward a Combined Arms Training Center" (concept Paper), Nov 86 [hereafter cited as Gorman, Combined Arms Training Center (concept paper)]. (2) Ltr, General (Ret) Paul F, Gorman to the author, 14 January 1991. (3) Quotation from FM 100-5 is on p. 1-1.

and tank cannon technology meant that much more land was required to shoot artillery safely, especially when rocket-assisted rounds, then under development, were fielded. The same was true of tank cannon, where the safety fan would greatly increase when the Mark 735 round was fielded. The newest of the Army's tanks were being designed to fire on the move using projectiles fired at a muzzle velocity of one mile per second. At 15 percent of elevation, the range fan consumed 208,000 acres. In the face of those rapid advances in technology and changes in operational doctrine, the Army, Gorman asserted, had failed to articulate to Congress that an army had to train the way it would fight — and that meant it needed maneuver room.[4]

Such an idea was not without precedent. In 1968, a study resulting from the poor kill ratio of U.S. Navy aviators in Vietnam pointed to deficient training in air-to-air combat as partly to blame. The following year, the Navy acted on the report and established a special Naval Fighter Weapons School — nicknamed "Top Gun"— to train its fighter interceptor crews in close combat between jets. The force-on-force training pitted A-4 Skyhawks against F-4 Phantom jets. Partly as a result of that training, from 1969-1972 the kill ratios in Vietnam rose from 2.1 to 12 enemy jets lost for every American jet lost. Meanwhile, the U.S. Air Force's Tactical Air Command, which bore the main burdens of the air war in Southeast Asia, explicitly stated its dissatisfaction with its performance. Carrier squadrons of the Navy did better than TAC squadrons, even when they were flying the same aircraft. Similarly, a Litton Corporation study by Herbert K. Weiss—using statistics from World War II, Korea, and Vietnam—showed that in their first combat engagement, American pilots had only a 60 percent chance of survival as opposed to a 90 percent chance after ten engagements. As a result, the U.S. Air Force established its own version of Top Gun.[5]

The Air Force's force-on-force exercises, code-named "Operation Red Flag," were conducted at an instrumented combat training range at Nellis Air Force Base, Nevada. There, under the management of the Tactical Fighter Weapons Center, aircrews from the Tactical Air Command (TAC) were exposed to realistic combat situations, an active electromagnetic environment, and an extensive ground-based air defense system. The training included an opposing force from the 64th Fighter Weapons Squadron which was trained in Soviet-style tactics and flew aircraft with Soviet

---

4 Gorman, Combined Arms Training Center (speech), Nov 76.

5 (1) Timothy James Reischl, "An Examination of Battalion Training at the National Training Center" (M.S. Thesis, Naval Postgraduate School, May 1980), pp. 14-15 [Hereafter cited as Reischl, "Battalion Training at the NTC"]. (2) Lt Col Robert L. Herndon, "The Army's National Training Center: A Case Study in Management of a Large Defense Project" (M.S. Thesis, Massachusetts Institute of Technology, 1983), pp. 19-20 [hereafter cited as Herndon, "National Training Center"]. Lt Col Herndon served as Army Staff proponent for the NTC while assigned to the Office of the Deputy Chief of Staff for Operations and Plans, HQDA, from July 1978 until July 1981. (3) Gorman, "Combined Arms Training Center," (speech) Nov 76. (4) Harold K. Weiss, "Systems Analysis Problems of Limited War," *Annals of Reliability and Maintainability*, (New York,1966). (5) The Navy study of 1968 was conducted by Captain Frank W. Ault, former commander of the USS *Coral Sea*. It was entitled Air-to-air Systems Capability Review of 1968." Daniel P. Bolger, *Dragons at War 2-34th Infantry in the Mojave*, (Novato, Calif.: Presidio Press), p. 16.

identification markings. The combat training range also included a replica of part of East Germany complete with Soviet airfields, a simulated forward edge of the battlefield with arrays of tanks, artillery, and trucks, and a series of realistic interdiction targets. Maneuvers were monitored by instrumentation which provided data for objective post-mission evaluation. Thus, the theory went, pilots were permitted to fly their first ten missions in a simulated war thereby making available to air commanders a 30 percent increase in the number of aircraft available in actual combat. Every squadron in the Tactical Air Force was scheduled to go through this three-week exercise every eighteen months in rotation. The concept of simulating the first ten missions struck a chord with many of the Army's senior leaders, who were aware that U.S. forces had, historically, not fared well in their first battles since the time of the American Revolution.[6]

In his concept paper and in the aforementioned address to the project managers in November 1976, Maj. Gen. Gorman took great care to explain to his audience how the Air Force was attempting to solve its training "real estate" problems through realistic tactical engagement simulation, and suggested the Army follow suit. In its post-Vietnam "revolution," Army training, he suggested, was "evolving in much the same way in which TAC's training management improved over the years—except that we are five years behind or more." Noting that, unlike conventional air training which "left participants with fleeting impressions of the mock combat to be argued over at the bar," exercises like Red Flag offered the opportunity to capture the action so that in after-action critiques, skilled instructors could "build on the fresh experience of participants so as to ingrain the lessons which the exercise should have taught." He described a test conducted on an instrumented range at Fort Hood to determine the effectiveness of three-tank platoons as opposed to five-tank platoons. While the test did provide valuable information on force structure, its most important conclusion was that combat experience and feedback brought to bear on learning had greater impact on success than did force structure.[7]

Gorman went on to point out that the Army had virtually no means of collecting training data and observed that "one of the reasons why the Combined Arms Center hasn't been an effective integrating center is the fact that it does not have a lot of data being turned in by ordinary units trying to do their job in a well simulated operational environment, as opposed to the special circumstances that tend to surround quote 'tests' unquote." He noted that much of the sophisticated instrumentation needed for engagement simulation was already under development. This was true of the Army's Multiple Integrated Laser Engagement System (MILES) which was scheduled to be fielded in 1979. Gorman suggested that the Army establish its own "Red Flag" at Fort Irwin in the high desert of California near the Air Force training center at Nellis Air Force Base. Force-on-force exercises conducted there

6 Gorman, "Combined Arms Training Center" (speech), Nov 76. Later in a March 1981 report, a study group of the Army Science Board would conclude that "the demonstrated superiority of Iranian pilots over Iraqi pilots can be at least partially attributed to their previous participation in Red Flag training." Army Science Board Sub-Group Report on the Army National Training Center, March 1981, p. 1.

7 Gorman, "Combined Arms Training Center" (concept paper), pp. 1-15, quotations on pp. 5, 9.

against troops trained in Soviet doctrine and employing Soviet-type equipment—combined with an active electronic warfare environment, full air weapon play, and live-fire exercises—could make Fort Irwin "the Army's laboratory for advanced training technology."[8]

As noted above, Maj. Gen. Gorman and his staff at TRADOC had developed the central training center concept at General Rogers' request. In their Joint Posture Statement to Congress early in 1977, Rogers and Secretary of the Army Clifford L. Alexander, Jr., gave the idea its first public exposure:

> *The Army foresees one or more National Training Centers, large military reservations which can support the kind of combined arms training needed to ready the total Army for battle in Europe.*[9]

Maj. Gen. Gorman forwarded a copy of his plan to Lt. Gen. Meyer at Department of the Army headquarters. Meyer informally approved further development of the concept. On 11 April 1977, General Walter T. Kerwin, Vice Chief of Staff of the Army, formally gave approval to the concept of one national combined-arms unit training facility to begin operations in fiscal year 1980. The following month, on 23 May, TRADOC published a concept paper, authored by Gorman and his staff, detailing the command's position on the establishment and implementation of not one, but three, "national training centers," which would be technologically advanced training complexes consisting of Army and Air Force installations.[10]

The shift from the proposed establishment of one training center to three such centers appears to have been an effort to soothe the fears of some congressmen from the Northeast who strongly opposed any move to close bases in their area in favor of activities at "Sun Belt" bases. The proposed sites were Fort Drum-Griffiss Air Force Base in the Northeast where reserve component units and active Army commanders and staffs would be trained on terrain resembling that of Europe; Fort Stewart-Eglin Air Force Base in the Southeast for light division training; and Fort Irwin-Nellis Air Force Base in the Southwest for the training of heavy forces. Despite the change in concept, Fort Irwin remained the central focus of Gorman's plan, and this time he gave the exercises he wished to see conducted at Fort Irwin a name: RED BANNER, as the counterpart of the Air Force's RED FLAG.[11]

Gorman's argument in support of the establishment of large centralized training facilities for battalion level forces generally followed the same lines as his plan of 1976. But this time he also

---

8 Gorman, "Combined Arms Training Center" (speech), quotations on pp. 15 and 16. The Army's MILES was not actually fielded until 1981.

9 The Posture of the Army and Department of the Army Revised Budget Estimates for Fiscal Year 1978, Joint Statement by the Secretary of the Army and Chief of Staff before Committees of Congress, February 1977, p. 109.

10 (1) Gorman, "Toward National Training Centers," 23 May 77. (2) Col Kenneth W. Simpson, Lt Col David R.R. Hale, and Lt Col Bryan A. Sutherland, "The National Training Center: A Critique of Data Collection and Dissemination," Mar 1985 [hereafter cited as Simpson, et al, "Critique"]. (3) Semiannual Historical Report, ODCST, 1 Oct 77-30 Mar 78, p. 38 [hereafter cited as SSHR, ODCST, (date)].

11 (1) Gorman, "Toward National Training Centers, 23 May 77. (2) Eglin Air Force Base was the home of the Tactical Air Command's Tactical Warfare Center and the Air Force/Army Air Ground Operations School.

included information on unit training areas that had been established by other forces to meet the needs of training modern armies. The Israeli Defense Forces training reserve at Sinai/Negev had the capability to train five battalions simultaneously in mounted warfare, employing ten-day training periods. United Kingdom and Federal Republic of Germany forces leased the Suffield (640,000 acres) and Shilo (180,000 acres) training areas, respectively, from Canada for training battalion task forces. Soviet forces in Germany also trained in a number of areas ranging up to 130,000 acres, in which they held regimental (brigade) size live-fire exercises. Convinced that a single facility could not handle the total Army training task, Gorman presented a carefully argued case for centralized training facilities in the Northeastern, Southeastern, and Western United States.[12]

Toward Establishment of an NTC or NTCs

The TRADOC National Training Center team of the Training Developments Directorate completed an analysis of several alternatives and options within those alternatives. The choices ranged from the rotation of six battalion task forces a year to forty-six battalion task forces per year. Planners believed the latter concept was the optimum if every armor and mechanized infantry battalion commander was to experience NTC training during his command tour of duty. Their detailed analysis was based on feasibility and cost, versus the projected advantages to unit training and readiness. The project would be a joint FORSCOM and TRADOC venture. Because unit training in the continental United States was a FORSCOM responsibility, it was designated as the lead agency in "developing and coordinating this initiative." TRADOC would assume responsibility for the development and operation of the training environment to include an instrumentation system, a live-fire range, and electronic warfare simulation. The Unit Training Directorate of the Combined Arms Training Development Activity (CATRADA) at Fort Leavenworth would develop the training plans and scenarios. The exact division of authority and responsibility was not clearly spelled out, and this issue would remain a source of contention between the two commands throughout the early development process.[13]

---

12 Gorman, "Toward National Training Centers," 23 May 77.

13 (1) This section closely follows Lt Col Herndon's account in "National Training Center," especially pp. 22-24. Quotation is on p. 24. (2) National Training Center Development Plan, 3 April 79 [hereafter cited as NTC Development Plan, Apr 79]. (3) General Gorman's original concept envisioned that officers and noncommissioned officers in TRADOC service schools would also receive training at the NTC, and that the training center would serve USAREUR as a sort of "reverse REFORGER" experience. Neither of these ideas survived final planning. However, in the early 1980s, FORSCOM implemented the Senior Leader Training Program, which brought battalion and brigade command designees to the NTC to observe the performance of rotating units. (4) Responsibility for scenario development remained with the CGSC only until January 1982, when the Chief of the TRADOC Operations Group assumed responsibility for planning and conduct of training at the NTC, including scenario development. Final approval authority was then vested in the NTC Commander. See Col (Ret) William L. Shackelford, "NTC Perspectives," pp. VI-4 to VI-6. Col Shackelford was Chief of the TRADOC Operations Group at the NTC from January 1982 to September 1984.

Meanwhile, FORSCOM was experimenting with desert training along the lines of General Gorman's concept. During the summer of 1976, that command developed a "desert environmental training concept" which provided for the rotation of four FORSCOM armor battalions to Fort Irwin each year, beginning in October 1976, for six weeks of intensive training. Units would make heavy use of equipment belonging to the California National Guard, which was stored at the Mobilization and Training Equipment Site at Fort Irwin. The RED FLAG squadron stationed at Nellis Air Force Base, Nevada, would provide close air support.[14]

On 23 May 1977, FORSCOM held a working conference with TRADOC, the Defense Advanced Research Projects Agency (DARPA), the U.S. Army Materiel Development and Readiness Command (DARCOM), and the U.S. Air Force Tactical Air Command (TAC) to define the training center concept further and identify initiatives. As noted above, Maj. Gen. Gorman had by now changed the name of the projected facility or facilities to the "National Training Center(s)" (NTC). Conference participants dealt with the issues of site selection, environmental documentation, funding, and scheduling. In July 1977, FORSCOM assigned Col. John C. Lippencott as NTC project manager. TRADOC also established a planning staff led by Lt. Col. Richard I. Edwards as program manager. On 21 December 1977 the NTC planners presented the plan agreed upon to the TRADOC and FORSCOM commanders. While both approved the briefing, the Development Plan was never signed by anyone except the TRADOC systems manager. Although it would be the basis for initial TRADOC planning and resource allocation, FORSCOM never officially acknowledged it. That omission would come back to haunt TRADOC during the early implementation of the NTC plan. Nevertheless, the plan received joint approval for submission in both headquarters' program analysis and resource reviews, or PARR, submitted to the Department of the Army every January.[15]

The PARR was a report which highlighted the command's most important programs and laid out goals and objectives for the future. The TRADOC FY 1980-1984 PARR included $2.3 million for the NTC in FY 1980. The FORSCOM PARR for the same period applied $9.5 million to the NTC in FY 1980. The two commands presented the concept and projected costs of development and operation to General Kerwin and the Army Staff in a joint briefing on 2 February 1978. Maj. Gen. John W. Seigle had by that time replaced Maj. Gen. Gorman as TRADOC Deputy Chief of Staff for Training, Gorman having departed to command the 8th Infantry Division. By this time, in the face of a variety of airspace, environmental, and budgetary constraints, and despite Maj. Gen. Gorman's elaborate argument, plans for more than one "national training center" had given way to development of one large facility. According to plan, by 1984 forty-two armored and mechanized infantry battalion

14 U.S. Army Forces Command (hereafter cited as FORSCOM) Annual Historical Review, FY 1976 (1 Jul 75 - 30 Sep 76), pp. 284-85. (SECRET — Information used is UNCLASSIFIED)

15 (1) Herndon, "National Training Center," pp. 23, 49. (2) Gorman, "National Training Centers," 23 May 77. (3) Decision Paper ATZL-TDD-N through DCDR, CATRADA to DCG for Combined Arms [TRADOC], 11 Dec 81, subj: Support for NTC.

task forces per year would rotate through the center, two at a time, for a period of continuous field training.[16]

According to a memorandum for record prepared by TRADOC commander General Donn A. Starry's executive officer, at the end of the February 1978 meeting General Kerwin opened up the subject for discussion. At that time, the attendees identified a number of issues and expressed many concerns that NTC developers would come to know all too well as plans for the training center unfolded. Lt. Gen. Meyer, the Army's Deputy Chief of Staff for Operations and Plans, insisted that if the NTC were to be the Army's capstone training event, the service had to have a complete training concept into which such a facility would fit. Meyer also expressed concern that troops would be training in the desert using NATO scenarios. General Starry explained that ranges could be scaled to match the NATO environment. Meyer then asked what impact establishment of the NTC would have on the argument for more land at other installations. The FORSCOM commander, General Frederick J. Kroesen, cautioned that "we should put forth the argument that we need both the NTC and additional land at home stations." Both Meyer and Kroesen stressed the need for the development of "objective measures of readiness" if a venture such as a NTC were to be justified.[17]

Others on the Army Staff expressed concerns that related to their particular functions. Most of their comments had to do with costs. Maj. Gen. William R. Wray, Assistant Chief of Engineers, assuming that Fort Irwin would be the chosen site, believed that the $20 million requested for construction sounded much too low in view of the need for a commissary and housing.

---

16 Semiannual Historical Report, ODCSRM, Apr - Sep 78, p. 2. (2) FORSCOM Annual Historical Reviews, FY 1977, p. 286; FY 1978, p. 232 (Both SECRET — Information used is UNCLASSIFIED).

17 (1) Ltr General Donn A. Starry to Mr. A. W. Marshall, Office of the Secretary of Defense, 9 Mar 78, Starry Papers, U.S. Army Military History Institute, Carlisle Barracks, Pa. (3) In attendance at the briefing on 2 Feb 78 were:
Gen Walter T. Kerwin (VCSA)
Gen Frederick J. Kroesen (Cdr FORSCOM)
Gen Donn A. Starry (Cdr TRADOC)
Lt Gen John R. McGiffert II (Dir, ARStaff)
Lt Gen Richard L. West (Comptroller)
Lt Gen Edward C. Meyer (DCSOPS)
Maj Gen James M. Lee (Chief, Legislative Liaison)
Maj Gen William R. Wray (Asst. Chief of Engineers)
Maj Gen John C. Faith (ODCSOPS)
Maj Gen James F. Cochran III (ODCSOPS
Maj Gen Maxwell R. Thurman (Dir. Program Analysis and Evaluation)
Maj Gen John W. Seigle (DCST-TRADOC)
Maj Gen Oren E. Dellavan (ADCS Logistics)
Brig Gen Richard D. Lawrence (OCSA)
Brig Gen Russell I. Berry (Office, Chief of Army Reserves)
Brig Gen Emmett H. Walker, Jr. (Dir., Army National Guard)
Brig Gen Corey J. Wright (OCA)
Brig Gen John A. Smith, Jr. (Deputy Asst. Chief of Staff for Intelligence)
Brig Gen Lewis C. Wagner, Jr. (ODCS Research, Development and Acquisition)
Col John C. Lippencott (Program Manager NTC-FORSCOM)
Col E. Stanley Diez (ODCST-TRADOC)
Lt Col Richard I. Edwards (ODCST-TRADOC)

Maj. Gen. Cochran of the ODCSOPS cautioned that "the requirement for additional spaces means that the Army must decide how bad it wants the NTC." Brig. Gen. Lewis E. Wagner of the Office of the Deputy Chief of Staff for Research, Development, and Acquisition asked where the equipment was going to come from and what costs would be incurred in adapting it to tactical engagement simulation. Maj. Gen. Maxwell R. Thurman, the Army's director of Program Analysis and Evaluation, while supporting a NTC, thought the briefing had not adequately addressed instrumentation requirements. Maj. Gen. James M. Lee, the Chief Legislative Liaison officer pointed out that no suggestion should be made that a NTC would reduce the use of Fort Drum, because "it would be hard to sell the NTC on the Hill if Drum were reduced." Brig. Gen. Richard D. Lawrence of the Army Chief of Staff's office expressed doubt about the cooperation of the National Aeronautics and Space Administration in view of possible detriment to the function of its Goldstone Space Tracking Station from air operations and electronic warfare. General Kerwin also was uneasy about NASA's reaction. Kerwin assured the presenters from TRADOC and FORSCOM that General Bernard W. Rogers, Chief of Staff of the Army, favored the NTC concept, but expressed his own belief that the project was "undercosted by 1 1/2 to 2 times." General Starry assured the representatives of the Army Staff that most of the issues raised had been considered in the initial planning.[18]

Less than two weeks later Kerwin approved the concept and directed it be submitted to the Department of the Army staff so that it might compete for funding with high priority in the Program Objective Memorandum (POM) cycle for FY 1980. The POM, published each May, constituted the basis for the programs the Army Staff proposed as its portion of national defense strategy. Specifically it contained funding schedules with regard to research, development, procurement, test and evaluation, and operations and maintenance, all of which were designed to aid in the formulation of the defense budget. The POM cycle covered a five-year period beginning two fiscal years from date of publication.[19]

Continued support at this point in 1978 for such a costly project in the face of severely constrained resources, was owed in part to the conclusions of the controversial Army Training Study directed by Brig. Gen. Frederic J. Brown, III. Beginning in October 1977, under a directive from the Department of the Army, Brown and his associates began to examine the links between training resources, training programs, training readiness, and combat effectiveness. A major focus of the study was the examination of the training challenges the Army was facing as it shifted from the draft era to an all-volunteer Army. In its final report issued 8 August 1978, the board concluded that "the average level of attainment of standards present in the force today is not sufficiently high for the magnitude of the battlefield tasks." Among other suggestions for a new and integrated training system for the Army, the 1978 report asserted that the Army had to be able to measure proficiency objectively and

---

18 Memorandum for Record ATTNG-TDD, 10 Feb 78, subj: National Training Center Briefing to the Vice Chief of Staff of the Army, Donn A. Starry Papers, U.S. Army Military History Institute, Carlisle Barracks, Pa.

19 Semiannual Staff Historical Report, ODCSRM, Apr - Sep 78, p. 2. (2) FORSCOM Annual Historical Review, FY 1977, p. 286; FY 1978, p. 232. (Both SECRET—Information used is UNCLASSIFIED)

to verify that that proficiency was translated into combat effectiveness. One way to do this was to increase emphasis on the instrumented battlefield and battle simulations.[20]

Although the Army Training Study was marked "For Official Use Only," and not released to the public, the *Washington Star* managed to obtain a complete set of the study's twelve volumes. Press reports regarding the study maintained that the caliber of Army training was low. They also asserted that the intelligence levels of many in the all-volunteer Army was too low to permit the operation of tanks and air defense systems to Army standards. It would be difficult to determine which of these factors—the study conclusions or the public reporting of them—was most influential with senior Army trainers. In any case, the proposed NTC seemed to offer an imaginative and innovative training solution that would be very visible.[21]

Two other studies conducted under the guidance of TRADOC's second commander, General Starry, also had some impact on continued interest in a central training facility for units. The Review of Education and Training for Officers (RETO) Study, begun in 1977, and usually known as the Harrison Board after its chairman Maj. Gen. Benjamin L. Harrison, convened to study the training of officers from precommissioning through general officer positions and to build a coherent system of officer training. The Long-Range Training Base Study, or Jenes Report, dealt with the facilities available for training in the light of base closures and realignments. The findings of those studies, while not directly related to the development of the NTC, did act to keep training issues in the forefront of Army concerns.[22]

Meanwhile planning for the NTC continued at TRADOC. The Combined Arms Center, which had been assigned responsibility for the NTC test program and scenario development, completed a detailed training plan. During the same time, TRADOC developed an evaluation plan and an instrumentation plan. On 19 March 1979, General Starry approved the combined development plans which established the NTC as a battalion combined arms training system and set forth milestones and schedules for accomplishment. He also set the goal of "initial operational capability" for the NTC, for the late summer or early fall of 1981. On 3 April 1979, TRADOC published the National Training Center Development Plan as an unofficial document "to initiate a broader planning base for action officer coordination at CAC, the TRADOC schools and test agencies, HQ FORSCOM, and DARCOM agencies." The Department of the Army concurred in the development plan on 25 May 1979.[23]

The NTC development plan included most of the elements Maj. Gen. Gorman had envisioned for his "Western training center" at Fort Irwin, but gone was the code name RED BANNER. The TRADOC planning group and senior Army officials envisioned an NTC that would provide the Army

---

20 Army Training Study Final Report Summary, Department of the Army, 8 Aug 78, pp. 11-7, 11-8; quotation is on p. iii.

21 Newport News, Virginia *Daily Press*, 4 Feb 1980. p. 24.

22 TRADOC Annual Historical Review, FY 1978, pp. 36-54. (SECRET — Information used is UNCLASSIFIED)

23 (1) Semiannual Historical Reports, ODCST, 1 Oct 78 - 30 Mar 79, p. 28; 1 Apr - 30 Sep 79, p. 56. (2) NTC Development Plan, 3 Apr 79; quotation is from cover letter signed by Lt Col Richard I. Edwards, TRADOC System Manager for the NTC.

a training facility where a total combat environment could be simulated for training heavy battalion task forces. Such an environment would have realistic maneuver areas; battalion live fire range areas; an opposing force equipped to simulate a Soviet motorized rifle regiment; unconstrained air space; full nuclear, biological, and chemical warfare play; and integration of artillery, attack helicopters, and Air Force close air support. The center was to be fully instrumented to provide monitoring of exercises and the collection of hard data for objective assessment of "battlefield performance and the effectiveness of organizations and systems." In no case, however, was the instrumentation to detract from realism. Brigade command groups would be exercised through the employment of battle simulations and command post exercises. Those exercises, developers hoped, would improve command and control procedures without the cost of moving an entire brigade. At full implementation, planned for fiscal year 1984, exercises would be provided for two battalions and a brigade headquarters during any one rotation. Prior to full implementation, brigade headquarters would be responsible for battle management of a mixture of one actual, and up to two, "notional" battalions. The other rotational battalion would exercise under the control of the TRADOC Operations Group, using a different scenario. The NTC also provided a "notional" division headquarters, actually located in the Operations Center, which controlled but did not evaluate the brigade. The brigade, would evaluate itself using its own chain of command. In effect, then, until 1984 when the instrumentation was expected to be fully in place, planners envisioned Operations Group responsibility for only one battalion at a time. If all went as planned, each armor and mechanized battalion commander and his staff would train at the NTC twice every eighteen months, once as a command post exercise unit without troops and once with the entire battalion task force involved in field training exercises. Although the development plan did not spell it out, the concept as approved at Department of the Army level provided for NTC rotations to begin late in 1981 with an annual cycle of eight to twelve battalions. The number of battalions rotating annually would increase to twenty in FY 1982 and FY 1983, and to forty-two by 1984.[24]

After predeployment planning and training, battalions and their support elements (engineers, signal, artillery, logistics, etc.) would move to an air base near the NTC by military or commercial aircraft and then by bus to the training center. Upon arrival, they would draw prepositioned equipment according to procedures for deployment in Europe, and move to their initial position in the field. Each unit would then begin two weeks of live-fire and force-on-force engagement simulation training against appropriate force ratios, with maximum free maneuver, close air support, and full-power electronic warfare. In the tactical engagement simulation portion of their training, the rotating battalions, or Blue Forces, would fight against an enemy known as the OPFOR, for "opposing force."

---

24 (1) NTC Development Plan, Apr 79, pp. I-2 to I-3, quotation p. I-2. (2) TRADOC Briefing, 10 Feb 78. (3) William B. McGraf, et al, Science Applications, Inc. (SAI) for TRADOC and the Defense Advanced Research Projects Agency (DARPA), Report of Findings on National Training Center Functional Design and Development Schedules, Dec 1978, p. 137 [hereafter cited as SAI Report, Dec 78]. (4) Science Applications, Inc. for TRADOC, NTC Analysis Final Technical Report, March 1981, p. 10-1 [hereafter cited as SAI, Final Report, Mar 1981]. (5) Decision Paper ATZL-TDD-N through DCDR CATRADA to DCG for Combined Arms [TRADOC], 11 Dec 81, subj: Support for NTC.

All actions would be monitored and recorded either by sophisticated instrumentation and data gathering techniques or by trained observer-controllers (OC). Debriefing teams from the TRADOC permanent party operations group would process the data thus collected and provide an initial after-action review (AAR) no more than two hours after completion of each mission during the exercise. At the end of the two-week period, each unit would receive a final critique of performance. Take-home packages, made up of copies of the video and sound recordings and hard copies of the data collected during their participation in the maneuvers, would assist commanders in training at home station on weak areas identified at the NTC. The data would also allow preparation of a television-based record of the operations of rotational units which would be distributed to FORSCOM units and TRADOC schools for use in the analysis of doctrine, preparation of instructional materials, and unit training. The data collection project, the responsibility of the NTC Division of CATRADA at Fort Leavenworth, was scheduled for completion and full implementation in the fourth quarter of FY 1984.[25]

The NTC, then, would serve as a focal point of Army combined arms training, a place where battalions based in the continental United States could conduct unit training against a highly skilled opposing force in situations closely approximating actual combat conditions. By the end of FY 1979 the concept had been clearly defined and approved. The Army had designated the establishment of the NTC its highest training priority. However, despite strong support from senior Army leaders and the shield that high priority provided against the program's critics, the road of the NTC to implementation would not be smooth.

25 (1) NTC Development Plan, Apr 79, Appendix i, pp. 1-1 to 1-3. (2) Reischl, "Battalion Training at the NTC," pp. 20-30. (3) Semiannual Historical Reports, ODCST, 1 Oct 77-31 Mar 78, p. 38; 1 Apr - 30 Sep 83, p. 46. (4) For a complete list of the training missions available at the NTC, see John Scott Furman and Richard Lynn Wampler, "A Methodology for the Evaluation of Unit Tactical Proficiency at the National Training Center" (M.S. Thesis, Naval Postgraduate School. March 1982), Appendix A, pp. 168-69 [hereafter cited as Furman and Wampler, "Methodology"].

Chapter III

THE CHOICE OF FORT IRWIN

It's something we can't afford to do everywhere in the U.S. — but it's something we can't afford not to do someplace.

— Lt. Col. Allen R. Wissinger[1]

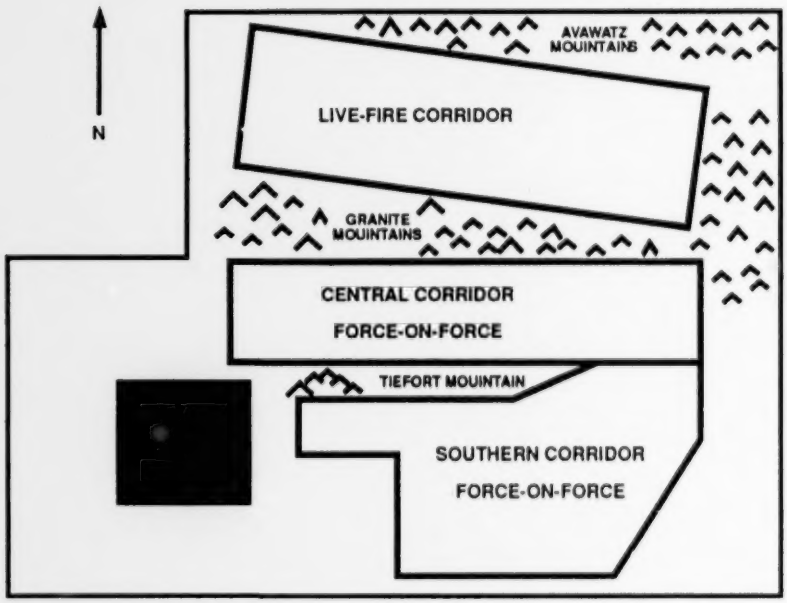
The Site Selection Process

One of the first major actions required to establish the National Training Center was to select a site for it. To aid in this process, FORSCOM identified six major factors as discriminators in evaluating potential locations. First, the terrain had to be sufficiently challenging to offer diversity and encourage innovation on the part of maneuvering units. Secondly, the chosen site had to be large enough to accommodate a live-fire range of approximately 68 kilometers by 20 kilometers. Thirdly, the electronic warfare training planned for the NTC dictated that the site be remote from commercial broadcast areas. In the fourth place, if AirLand Battle doctrine was to be realistically portrayed, air space had to be unconstrained, that is, restricted to military use. Fifth, weather conditions had to be favorable for air operations so as to present comparable challenges to all rotating battalions. Finally, the NTC had to be interoperable with the current mission of whatever site was selected. Although General Gorman had based his original concept on the assumption that the NTC would be located at Fort Irwin in California, twelve sites in the United States and Canada that generally met the size requirements were chosen for analysis. Developers judged only three of these to be possibilities: Twenty-nine Palms Marine Base, Calif.; Yuma Proving Ground, Ariz.; and Fort Irwin. Of those, only Fort Irwin had the necessary ground space for battalion live fire and opposed maneuver

1 Lt Col Wissinger was commander of the 6th Bn, 31st Inf (Mechanized), one of the OPFOR units, during the early days of the NTC.

exercises and air space for electronic warfare and close air support training. Also, its proximity to Nellis Air Force Base, 100 miles away, would facilitate Air Force cooperation, and its location approximately sixty miles from George Air Force Base would allow efficient deployment of troops to the NTC.[2]

In terms of the site selection criteria, Fort Irwin had other assets. Located in the high Mojave Desert of California, midway between Las Vegas and Los Angeles, the installation featured 642,805 acres (approximately 1,000 square miles) of highly varied terrain at a mean elevation of 2,300 feet (Map 1). A combination of rocky, arid mountain ranges, valleys broken by rills and small gullies, and scattered hill masses could provide cover from ground mounted weapons. Three mountain ranges naturally divided the potential training area into three corridors that could accommodate two separate force-on-force exercise areas and a live-fire range:



Source: COL William L. Shackelford, "NTC Perspectives," unpublished manuscript used with permission of the author, p. I-2

2 (1) This section on the process of choosing Fort Irwin as the site for the NTC owes much to Lt Col Herndon's "National Training Center," pp. 31-32. (2) TRADOC Briefing, 10 Feb 78. The twelve sites analyzed were: Ft Irwin, Calif.; Ft Hood, Tex.; Twenty-nine Palms Marine Base, Calif.; Ft Drum, N.Y.; Shilo Training Center, Canada; Nellis Air Force Base and Range, Nev.; China Lake Naval Weapons Center, Calif.; Dugway Proving Ground, Utah; Yuma Proving Ground, Ariz.; Pueblo-Serfano Tract, Colo.; Suffield Training Center, Canada; and Ft Bliss, Tex. Should Fort Irwin not be chosen, Maj. Gen. Gorman favored the Dugway Proving Ground.

Map 1
FORT IRWIN AND ASSOCIATED INSTALLATIONS

Source: Adapted from Maj Gen Paul F. Gorman, TRADOC Concept Paper, 23 May 77, "Toward National Training Center," p. 32.

The soil composition of sand and volcanic rock offered good traction for tracked and four-wheel drive vehicles which could maneuver freely throughout the post. Trafficability was limited only by hills and five artillery impact areas. With the exception of the impact areas, the terrain was almost 100 percent trafficable by foot troops. Fort Irwin was also adjacent to China Lake Naval Weapons Station and near Edwards Air Force Base and the Twenty-nine Palms Marine Corps Base, a location which placed it entirely within a militarily restricted air space. Despite winds up to 70 miles per hour, Fort Irwin averaged 360 clear flying days annually. Annual rainfall amounted to about four inches, which sometimes fell all in one day. In addition, the fact that Fort Irwin was located thirty-seven miles from the nearest civilian community at Barstow, Calif., meant that electronic warfare emissions would not interfere with commercial broadcasts. Neither would an NTC at Fort Irwin interfere with the installation's current mission. Since 1972, the inactive post had been leased by the State of California for the state's Army National Guard, who used it as a unit training center on weekends. The site's only permanent residents were snakes, lizards, ground squirrels, coyotes, kangaroo mice, and desert tortoises.[3]

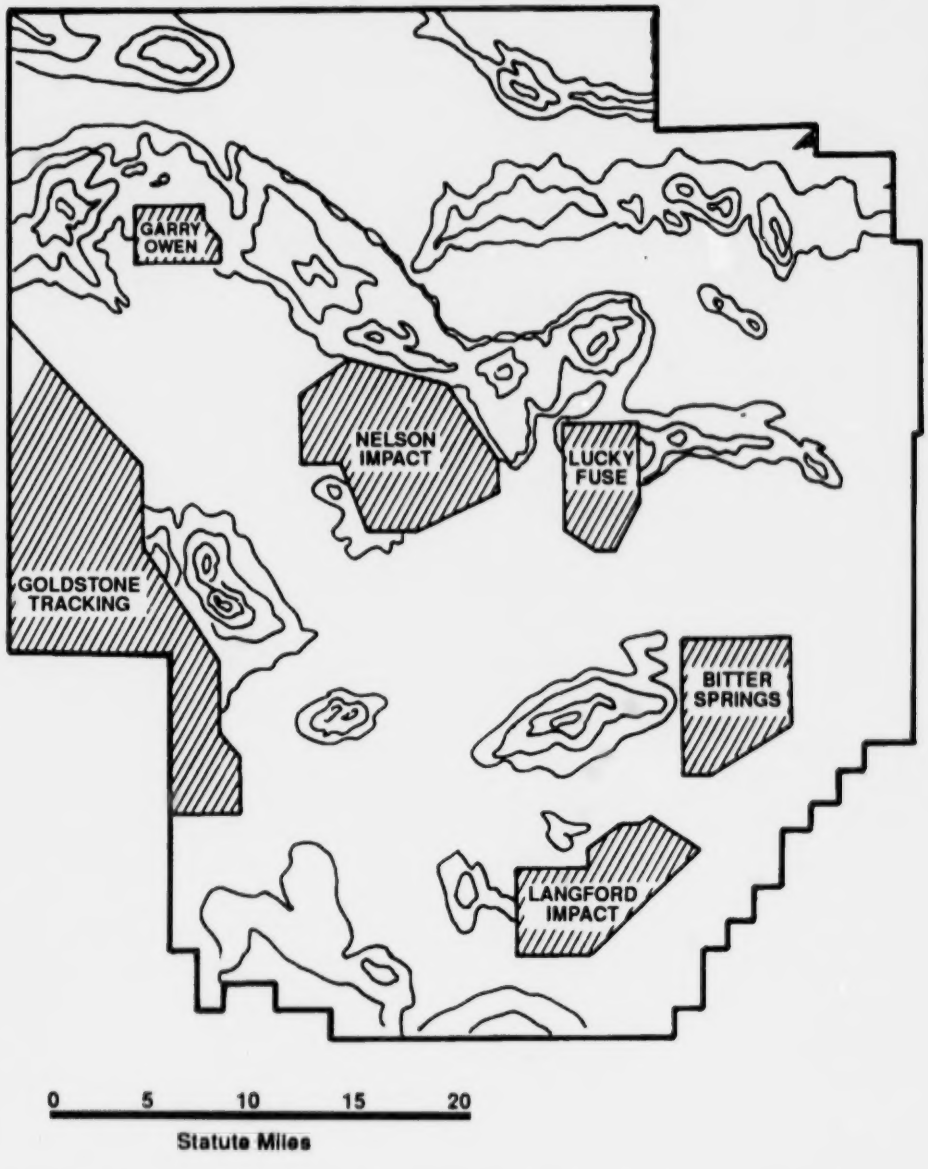
If these were Fort Irwin's assets, it also had drawbacks as a site for the proposed NTC. The lack of any but scrub vegetation made concealment from the air nearly impossible. The want of a road network, urban or built-up areas, snow and rain conditions, or limited visibility meant that the site little resembled the European terrain it was supposed to emulate. Further, temperatures of 100 degrees or more in summer and a wind chill as low as -10 degrees in winter could be expected to take their toll on soldiers and equipment alike. High winds and daily temperature variations of up to 70 degrees would adversely affect a sophisticated instrumentation system. The reservation would also make for expensive vehicular operations over long cantonment-to-training area distances as volcanic rock cut short track and tire life and dust took its toll on engines. Moreover, because the nearest railhead was in Barstow, thirty-seven miles away, shipments of ammunition and supplies would have to be made by road until a railroad spur could be constructed. The austerity and isolation of Fort Irwin meant that special attention would have to be paid to the physical environment in which the approximately 3,000 permanent party personnel and their families would live. Lastly, and perhaps the most negative factor, was the existence of the five artillery impact areas which fragmented the most challenging portion of the terrain. At least two of those would have to undergo an extensive explosive ordnance disposal clean-up before battalion task forces could realistically maneuver in the area (Map 2). Despite those negative factors, top level NTC planners continued to favor Fort Irwin as they had from the beginning. That fact probably surprised no one, in light of General Gorman's original assumption. However, before Fort Irwin could be officially reactivated and the NTC established, the Army had two more hurdles to clear: one with the Air Force and the other with the State Of California.[4]

---

3 (1) Reischl, "Battalion Training at the NTC," p. 30. (2) Herndon, "National Training Center," p. 33. (3) TRADOC Briefing, 10 Feb 78. (4) Shackelford, "NTC Perspectives," p. I-2.

4 (1)Reischl, "Battalion Training at the NTC," p. 30. (2) Herndon, "National Training Center," p. 33. (3) TRADOC Briefing, 10 Feb 78. (4) Gorman, "Combined Arms Training Center," (concept paper), Nov 76.

Map 2
FORT IRWIN ARTILLERY IMPACT AREAS



Source: Maj Gen Paul F. Gorman, TRADOC Concept Paper, "Toward National Training Centers," p. 32.

Although Fort Irwin's remoteness meant that electronic warfare training would not affect commercial radio, television, and micro-wave telephone service communications, the electromagnetic spectrum was not totally clear. The National Aeronautics and Space Administration (NASA) had constructed its Goldstone Deep Space Tracking Station on the southwest corner of Fort Irwin and worried that stray emissions might cause interference with the signal. Because electronic warfare play at the NTC would be a TRADOC responsibility, Col. Edwards, TRADOC program manager, contacted the Department of Defense Electromagnetic Capabilities Analysis Center and asked that that agency explore with NASA any potential problems. Study results showed that the Army and NASA operated on widely separated frequencies, and thus, potential for interference was minimal. However, to prevent future problems, the Center recommended procedures to screen and monitor all electronic equipment in the area for spurious emissions. In February 1979, NASA, the Army, the Navy, the Air Force, and the Office of the Secretary of Defense signed a memorandum of understanding to govern all electronic activities in the Mojave area so as to permit compatible operations by NASA and all the services.[5]

The Environmental Impact Statement

With the electronic interference issue resolved, the Army still could not formally declare Fort Irwin the site of its new and unique training center until an environmental impact statement had been filed and approved. The environmental documentation process brought the Army into direct conflict with the State of California and threatened to destroy the entire NTC project.

The Fort Irwin area of California had played a significant role in the history of western expansion, as well as in United States military activities. The old Spanish Trail, over which so many Americans had traveled to California in the nineteenth century, ran through the present site of Fort Irwin. In 1844 Captain John C. Fremont of the U.S. Corps of Topographical Engineers, accompanied by the famous scout Kit Carson, explored and mapped the area on the way back to St. Louis after exploration of uncharted western territories. In 1846, the Army had used the area as a camp for the Mormon Battalion before its deployment to fight in the Mexican War. Beginning in 1860, the Army had erected a stone fort on the site to serve as a base camp in the Indian wars. Just prior to World War II, the huge installation was designated the Mojave Anti-Aircraft Gunnery Range. In the early days of the War, General George S. Patton had established a desert training site there for armored vehicles. During the war the site also served as an internment facility for prisoners of war. In 1942, the post was named Camp Irwin for Maj. Gen. George Leroy Irwin, who had commanded field artillery units in World War I. The Army inactivated the camp in 1944 but reactivated it as a training center during the Korean War. In 1961 Camp Irwin was renamed Fort Irwin, and during the Vietnam War it served as a predeployment center for units enroute to combat theaters. On 31 December 1970, U.S. Sixth

5 Herndon, "National Training Center," pp. 33-34.

Army inactivated Fort Irwin for budgeting concerns and placed it in a "caretaker" status to serve as a training installation for units of the reserve components and for use as a mobilization facility. Since 1 September 1972, it had been the responsibility of the California Army National Guard.[6]

The fragility of the desert environment caused many in California to seriously consider the impact a facility like the NTC might have on the area. In the summer of 1977, the Army—through the Sacramento District Engineer—contracted with EDAW, Inc., a San Francisco-based consulting firm, to prepare the documentation for the required environmental impact statement. According to FORSCOM's historical account of the period, the command completed a draft impact statement in June 1978 but, because of the many alterations required by the Department of the Army, could not file it until the fall. A draft, which by that time had cost FORSCOM $85,000, was finally filed in October 1978. The document contained information on all three sites still considered to be possible locations for the NTC. During the last week of October, public hearings were held at Barstow, Calif., Yuma, Ariz., and Twenty-Nine Palms, Calif. Up to that point, according to the incumbent Army staff proponent for the NTC, no California state or local authorities had been contacted. Although FORSCOM's records would seem to indicate differently, the aforementioned staff officer later declared that "once the contract to EDAW, Inc. had been awarded, FORSCOM stepped out of the environmental picture until the draft statement was published and public hearings conducted." During the hearings in California, the State of California's Resources Agency voiced strong opposition to the location of the NTC at Fort Irwin on the grounds that the Army had not satisfied the state's concern for adverse environmental and socio-economic impacts. FORSCOM addressed the Resource Agency's concerns in the final environmental impact statement filed with the Environmental Protection Agency on 19 January 1979. At that point, the California Resources Agency voiced objections so strong that Maj. Gen. James C. Smith, Army Director of Training, decided to file an amendment to the final environmental impact statement to answer them in detail.[7]

On 4-5 April 1979, representatives from Department of the Army headquarters and FORSCOM met with California officials in order to prepare the amendment, which was distributed on 31 May. The California Resources Agency, however, was still not satisfied, and on 6 July its acting director requested that the Defense Subcommittee of the House of Representatives Appropriations Committee withdraw all funding for the NTC from the FY 1980 budget. On 26 July 1979, the subcommittee deleted NTC funding in its initial budget review, leaving the Army only eight weeks to settle the issue if funding was to be available in FY 1980. When a meeting in Sacramento on 9 August 1979 between Maj. Gen. Smith and California authorities failed to resolve the problems, senior Army officials discussed their case with United States Representative Jerry Lewis, who represented the Fort Irwin

6 (1) Herndon, "National Training Center," pp. 32-33. (2) CONARC/ARSTRIKE Annual Historical Summary, FY 1971, p. 28. (CONFIDENTIAL – Information used is UNCLASSIFIED) (3) Full treatment of General Patton's desert training ventures can be found in *The Desert Training Center*, C-AMA, Study 15, Historical Section, Army Ground Forces, 1946.

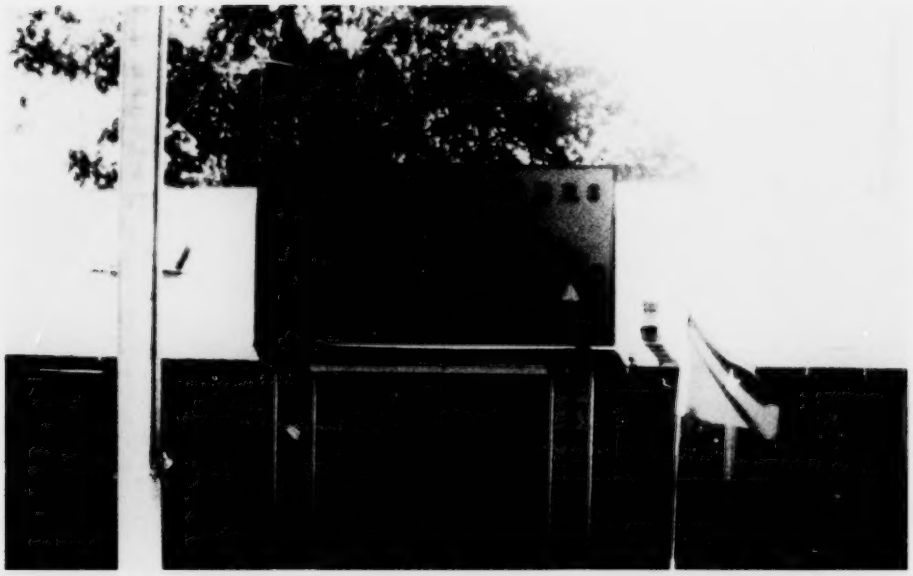
7 (1) Herndon, "National Training Center," pp. 34-38, quotation on pp. 34-35. (2) FORSCOM Annual Historical Review, FY 1978, p. 191.

area. Lewis convinced some like-minded members of the California Assembly to sponsor a resolution endorsing establishment of the NTC at Fort Irwin. That resolution was unanimously endorsed on 5 September 1979. Supported by the Assembly, Maj. Gen. Smith met again with California officials at San Bernardino the following day. After the Army had specifically countered the concerns of California environmentalists, a memorandum of understanding was signed between the Army and the State of California. California officials immediately requested that the Defense Subcommittee restore the NTC funding request. On 20 September 1979 the Committee voted unanimously to reinstitute funding for the NTC. Meanwhile, on 8 August 1979—anticipating settlement with California—the Deputy Secretary of Defense approved the establishment of the NTC at Fort Irwin, with reactivation of the fort scheduled for 1 July 1981. After two years of site analysis, deliberation, and failure to reach agreement with California officials, the NTC finally had a home.[8]

8 (1) Herndon, "National Training Center," pp. 34-38. (2) FORSCOM Annual Historical Review, FY 1979, p. 216 (SECRET – Information used is UNCLASSIFIED)

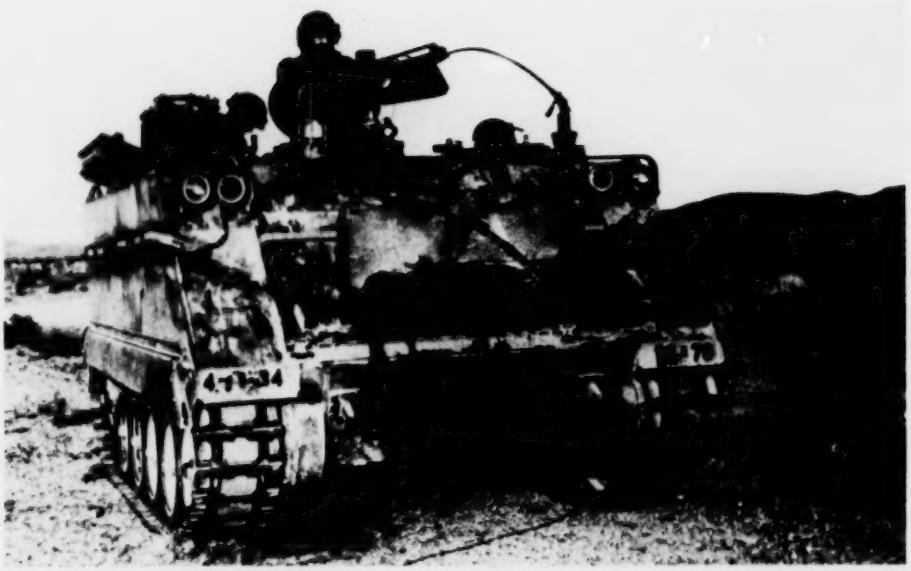
The main entrance to Fort Irwin.
The magnitude of the NTC opens up to view at the crest of the hill.

An example of the rocky and rugged Fort Irwin terrain, which took its toll on vehicles and troops alike.



The Headquarters of the U.S. Army's National Training Center, the most rigorous training facility in the world. The commander of the NTC, a brigadier general, is on duty, his flag posted.

A Blue Force soldier watches for enemy movement. The laser detectors on his helmet and harness will indicate hits, kills, or near misses from OPFOR fire.



A mechanized infantry squad mounted in an M113 Armored Personnel Carrier moves to contact with the OPFOR. Visible along the side of the APC is a belt of MILES sensors to register incoming hits. The strobe light to the gunner's right is activated when a hit is registered.

An OPFOR soldier mans a MILES-equipped M60 machine gun, modified to resemble a Soviet 12.7-mm. heavy machine gun, atop a BMP vehicle.

BEST COPY AVAILABLE

An OPFOR column heads for battle in its "VISMODed" T-72 tanks. The data transmitter antennas will relay battle hit and kill data to the NTC core instrumentation facility.

A BMP fires its 73-mm. smoothbore gun at a U.S. Army armored vehicle in the Valley of Death. The smoke from a Hoffman device indicates the gun's firing, while a MILES emitter records hits, kills, or near misses on the target.

Mobile cameras record the force-on-force maneuvers for use in after action reviews and for inclusion in the unit's take-home package.

A Range Management and Control Subsystem vehicle on the ridgeline provides audio-video communication to the core instrumentation facility. The camera crew on the left is recording an after action review for inclusion in the rotating unit's take home package.

BEST COPY AVAILABLE

Close-up of a Range Management and Control Subsystem audio-video communications vehicle.

His lonely vigil in the desert as yet unrewarded, a soldier equipped with MILES tries to maintain his alertness for OPFOR movement despite 115 degree midday temperatures in the Mojave Desert.

BEST COPY AVAILABLE

Chapter IV

IRONING OUT THE EARLY PROBLEMS

While the Army sought to come to terms with California concerning the use of Fort Irwin, problems between TRADOC and FORSCOM, as well as funding difficulties and personnel issues, further threatened to abort the entire NTC program. Even after the training center opened in July 1981, a number of unresolved issues prompted serious questions about its future. Indeed, not until Phase I implementation was well under way did the NTC begin to become the efficient and effective institution its designers and developers had envisioned. Even then, taking into consideration that the NTC was to be the "pinnacle of Army training," pointed questions lingered as to how much the Army's training system had really improved since the Vietnam era.

The Question of Responsibility

The size and scope of the project—and the fact that the NTC represented a radical departure from the existing Army training system—meant that both FORSCOM and TRADOC had to make organizational changes if the training and its evaluation were to be adequately managed. A major organizational problem during the planning stages resulted from the neglect of the Department of the Army to specify clearly each command's authority, responsibility, and accountability for the NTC effort. General Gorman's concept for the training center contained a strong argument that TRADOC ought to be the lead agency to insure that training, not operational readiness, always remained the primary goal. FORSCOM, on the basis of the command's responsibility for the combat readiness of active and reserve component Army units, believed it should have complete control over training at the NTC, with TRADOC relegated to an assisting role. TRADOC, on the other hand, insisted that it was responsible for the development of tactical doctrine and training management and thus should design and operate the training environment at Fort Irwin. Many of those problems were, perhaps, inherent in the division in 1973 of America's continental forces between TRADOC and FORSCOM, two four-star commands. While that 1973 solution to the problems of demobilization and

modernization proved sound, the relatively new organization tended to complicate changing the Army when disagreements arose over major programs.[1]

Whatever the cause, to make matters worse with regard to the NTC, neither command's project manager was subordinate to the other. Recognizing that this situation was sure to create problems, Lt. Col. Richard I. Edwards, systems manager at TRADOC, and Col. John C. Lippencott, project manager for FORSCOM, attempted to negotiate a memorandum of understanding to clearly delineate the division of authority. When they failed to do so, the Army Director of Training, Maj. Gen. James Smith, interceded and pushed through publication of Army Regulation 350-50, "National Training Center" (effective 15 April 1980), which prescribed the policies, objectives, and responsibilities of each command. Meanwhile, General Starry and General Robert M. Shoemaker, who had replaced General Kroesen as FORSCOM commander in August 1978, sent a joint letter to General Meyer expressing the need to have a general officer as commander of the NTC. The NTC commander, Meyer and Shoemaker agreed, should be responsive to both of them. In August 1979, Brig. Gen. James T. Bramlett was assigned to command the NTC.[2]

AR 350-50 placed overall responsibility for NTC policy in the Office of the Deputy Chief of Staff for Operations and Plans, Department of the Army. Planning and programming for the resources required for research, development, and procurement of materiel to support the NTC fell to the Department of the Army Deputy Chief of Staff for Research, Development, and Acquisition. FORSCOM would operate the training center as a FORSCOM training facility. In line with that responsibility, FORSCOM would provide the force structure for the OPFOR and base operations, the prepositioned equipment for rotating units, appoint a commander of the rank of Brigadier General to command all units and elements assigned to the NTC, and schedule all NTC training facilities (Table 1). To Forces Command also went responsibility for development of a master plan to prepare units for rotation and the development of cost data to establish and operate the NTC. TRADOC would plan, test, and establish the combat training and evaluation environment, plan the instrumentation system, and develop the threat-based unit training tasks and operational scenarios. The Training and Doctrine Command would also provide an Operations Group and develop the doctrine and training systems for the units which would serve as opposing forces (OPFOR) during force-on-force exercises. In cooperation with the U.S. Army Materiel Development and Readiness Command (DARCOM), TRADOC would provide the OPFOR vehicles, the visual modification (VISMOD) kits for those vehicles, and the engagement simulation equipment. Although the Operations Group would be a TRADOC element, both it and the OPFOR units would fall under the command of the NTC commander. All NTC support plans by other major commands were to be coordinated through FORSCOM; all training actions would be coordinated through both FORSCOM and TRADOC.[3]

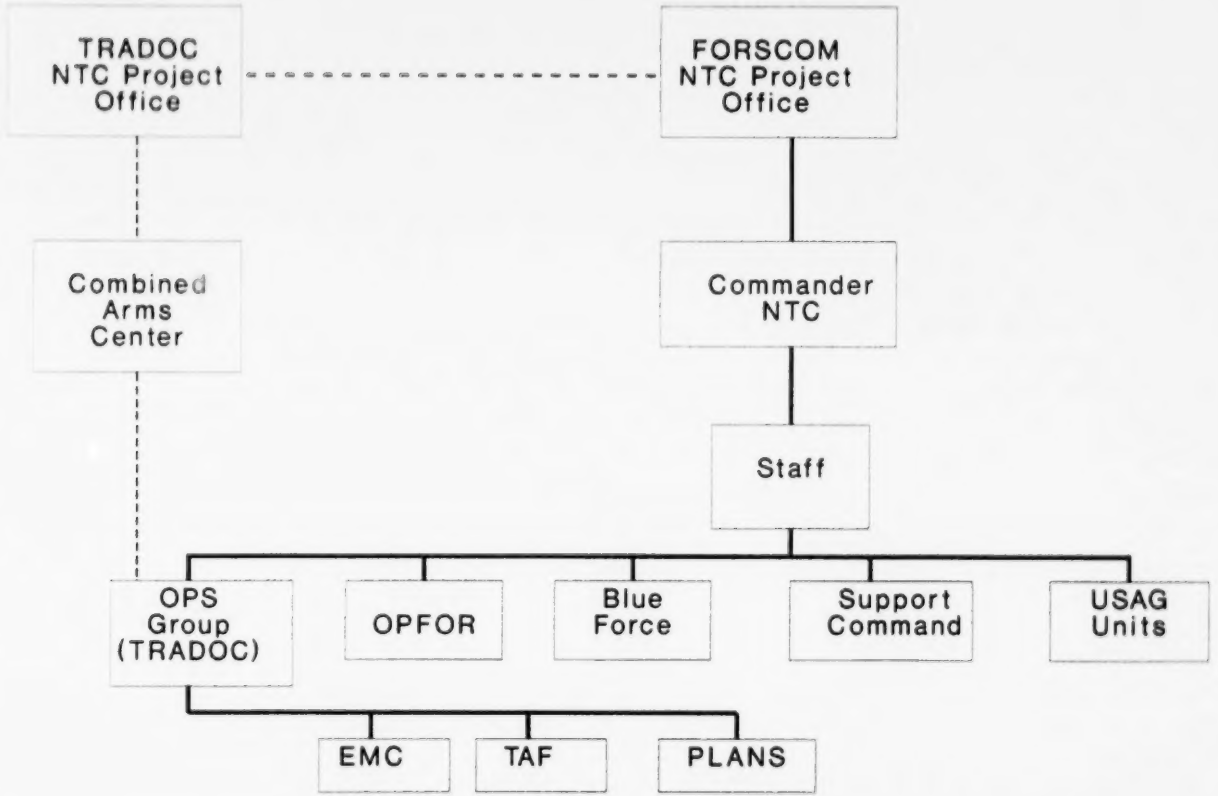
---

1 This account of the early problems and the fiscal planning for the NTC follows Lt. Col. Herndon's "National Training Center," pp. 27-28.

2 (1) Ibid. (2) General Donn A. Starry to General Robert M. Shoemaker, 6 Jul 79, Donn A. Starry Papers, U.S. Army Military History Institute, Carlisle Barracks, Pa. (3) General Officer Roster, April 1980.

3 AR 350-50, "National Training Center," 15 Mar 1980.

Table 1
NATIONAL TRAINING CENTER ORGANIZATION



Source: Briefing slide provided by NTC TRADOC Systems Manager's Office, Fort Monroe,Va., Jan 1980.

Even assuming the question of authority had been settled by Army regulation, that question was not the only source of contention between the two commands. Some top level planners believed that the commitment to the NTC's success among many at Department of the Army headquarters and at TRADOC, might not be fully shared at FORSCOM. From FORSCOM's point of view, the NTC plan placed on the command primary responsibility for a project conceived at TRADOC. The NTC would create not only a new unit training system but a new installation requiring command management. FORSCOM also complained that it had not received the additional personnel necessary for extensive planning efforts and resource estimates. In addition, none of its senior officers had been involved in the concept development process. Whatever the reason, in the first two years of planning, 1977-79, the FORSCOM NTC Project Office was staffed with only two officers, and no other members of the headquarters staff had organizational responsibility for initiatives in NTC development. In addition, the FORSCOM project manager, assigned in July 1977, had a mandatory retirement date of March 1979. When he retired, the position of NTC project manager remained vacant for six months, leaving only one person with full-time status in the NTC Project Office. It was the judgment of Lt. Col. Robert L. Herndon, Army Staff proponent for the NTC in the Office of the Deputy Chief of Staff for Operations and Plans, that

> *although FORSCOM superficially embraced the NTC—concept, the planning effort became an additional and secondary job for members of the FORSCOM staff. . . . As a result, major planning requirements were over-looked or given superficial treatment and coordination with other commands, agencies and political organizations were not established. . . . Although actively supporting the NTC in public, senior FORSCOM general officers on several occasions privately expressed their personal doubts to members of their staffs that the NTC would ever be established. Such doubts were translated into cursory efforts by the FORSCOM staff in developing resource, logistics, personnel, and engineer requirements for the NTC.*[4]

Underlying all these issues was a fundamental tension that resulted from two competing views of the desirability of centralizing training. Everyone agreed that responsibility for unit training rested with the unit chain of command, but with regard to execution, there was a broad range of opinion as to the relative merits of a centralized versus a decentralized environment. Indeed, TRADOC was reported as being seen by much of the Army as "the epitome of undesirable centralization imposing unnecessary 'good ideas' on an Army that was well along in self-correction." The NTC may have become a focal point of those concerns as arguments crystallized on high costs which "siphoned away FORSCOM funds which could have been better used by chains of command training at home station." FORSCOM unit commanders also worried that their performance at such a facility as the National Training Center might adversely affect their assignments and promotions.[5]

---

4 Herndon, "National Training Center," pp. 24, 29; quotations are on pp. 24 and 29. Lt Col Herndon's conclusions were based on his own experience, as well as on interviews with other top level planners.

5 Ltr, Lt Gen (Ret) Frederic J. Brown to the author, 2 January 1990.

Even after the NTC had been operational for more than two years, some senior officials at FORSCOM still felt they were not being treated as an equal partner in the ambitious training venture. For example, in May 1984, General Richard E. Cavazos, the FORSCOM commander, complained to General Maxwell R. Thurman, Army Vice Chief of Staff, that foreign visitors were being sent to the NTC without any prior notification to FORSCOM. He professed to be "enraged by the Army Staff making commitments about Forces Command without so much 'by your leave' to this command. No other MACOM in the Army suffers such direct action [that] usually involves expenditure of funds and precious resources that I know we'll not be reimbursed for." He continued: ". . . NTC is only for professionals not casual curious travelers. . . . We in most cases are never asked, just notified." [6]

In addition to those problems, in the early days of its development neither TRADOC nor FORSCOM established an office to press for the new training center. Although the NTC was designated the Army's highest priority training project, lack of organized promotion during the initial planning process threatened to destroy the entire project. Finally, in March 1979, Maj. Gen. James Smith, the Army's Director of Training in the office of the Deputy Chief of Staff for Operations and Plans, assumed responsibility for "selling" the NTC concept. In March 1980, he recommended that a general officer steering committee be created to give the NTC visibility, insure coordination between commands at the highest levels, and expedite problem-solving. Lt. Gen. Glenn K. Otis, who had replaced General Meyer as Deputy Chief of Staff for Operations and Plans when Meyer became Chief of Staff in June 1979, approved Smith's recommendation. The first NTC General Officer Steering Committee met at Fort McPherson, FORSCOM headquarters, on 12 May 1980. Chaired jointly by Lt. Gen. Marion C. Ross and Lt. Gen. William R. Richardson, deputy commanders of FORSCOM and TRADOC, respectively, the committee also included Maj. Gen. Smith. Other committee members were General Otis; Maj. Gen. Donald E. Rosenblum, TRADOC's Deputy Chief of Staff for Training; Maj. Gen. William R. Wray, the Assistant Chief of Engineers; Brig. Gen. Jeremiah J. Brophy, the commander of CATRADA, and Brig. Gen. Bramlett, the commanding general of the NTC and Fort Irwin. From the spring of 1980 until the reactivation of Fort Irwin in July 1981, the experienced members of the committee and their successors championed the NTC among its detractors and greatly facilitated its establishment.[7]

Funding and Budgets

While project developers struggled with the problems of division of authority and lack of support for the NTC, the staffs at FORSCOM and TRADOC began preparing the necessary resource estimates for establishing and operating the new center. If funding for the NTC was to be included in the FY 1980 budget, detailed cost estimates had to be filed by January 1978. Planners based their

---

6 Msg, Cdr FORSCOM to VCSA, 141935Z May 84, subj: Foreign Visitors to NTC.

7 (1) Herndon, "National Training Center," pp. 14-15, 28-29, 51-52. (2) *Department of the Army Historical Summary: Fiscal Year 1980*, Lenwood Y. Brown, ed. (Washington, D.C.: Center of Military History, United States Army, 1983), p. 52. General Edward C. Meyer served as Chief of Staff of the Army from 22 June 1979 to 21 June 1983.

estimates on the NTC's location at Fort Irwin, even though official site selection was not made until August 1979. Meanwhile, legal counsel at Department of the Army headquarters advised fiscal planners that until the environmental documentation issue was resolved with the State of California, no funds could be expended to conduct engineering studies of the existing facilities at Fort Irwin. FORSCOM planners had to base their estimates on records and several short field trips to Fort Irwin. In addition, because the reactivation of Fort Irwin was a "new" Army activity, FORSCOM was required to conduct a study to determine the relative advantages of military or Army civilian support of installation activities as opposed to contractor support. Fort Irwin was the first Army installation affected by the requirement to have all base operations activities studied for cost comparisons. According to Lt. Col. Herndon, "FORSCOM planners did not recognize the criticality of such a requirement and argued that the approval of the NTC concept also constituted approval of the manning concept which negated the need for the study." As a result, according to Herndon, more than thirty months elapsed before FORSCOM planners recognized that such a study was essential to NTC development.[8]

The developers' lack of experience with a project like the NTC also affected other fiscal planning. The NTC was unique compared to materiel development and acquisition projects in that only a small fraction of the cost would be earmarked for equipment and maintenance; the rest involved "people" issues like transportation of troops to the center, training, housing, facility repair, medical care, recreational facilities, etc. In the absence of guidelines, NTC managers had to break new ground. The lack of data, coupled with lack of experience and the fact that no formal methodology or comprehensive plan was developed to identify all possible resource requirements at the NTC, resulted in estimates that later proved much too low, just as General Kerwin had feared they would. Such inadequate initial resource identification and the resulting cost escalation mandated major program and budget revisions and provided NTC critics with a rationale for killing the entire program. It is worth noting here that the Army's budget requests to Congress included funds for the rotation of additional task forces for winter training at Fort Drum. The inclusion of that request was, without doubt, an attempt to head off strong objections from the "northeast caucus" based on their fears that bases in the northeast might be closed in favor of Sun Belt bases.[9]

The single most important factor affecting the budget and influencing resource shortages was the need to reactivate an inactive installation. Fort Irwin was the first Army post to be activated or reactivated in more than twenty years; thus there were few managers with experience in such planning. The NTC concept called for manning the facility with active duty soldiers reassigned from

---

8 (1) Herndon, "National Training Center," pp. 26-27, 39, 43 (quotation on p.43). (2) SAI Final Report, Mar 1981, p. 1.

9 (1) Herndon, "National Training Center," pp. 9, 39-40. (2) When a contract was awarded to Boeing Services International in July 1981, FORSCOM calculated that the savings to the government would amount to $6.2 million annually, 19 percent lower than the original estimate. *Department of the Army Historical Summary: Fiscal Year 1981*, Christine O. Hardyman, ed. (Washington, D.C.: Center of Military History, United States Army, 1988), p. 192. (3) U.S. Congress. Senate, Defense Subcommittee of the Committee on Appropriations. *Department of Defense Appropriations for Fiscal Year 1980*. 96th Cong., 1st sess., March 7, 1979.

other installations, and the use of equipment drawn from the Army inventory. The budget, therefore, did not have to include pay for military personnel, or the cost of administrative and training equipment which the Army would issue directly to the NTC. It did have to include installation support functions, housing for approximately 3,000 soldiers and civilian personnel and their families, and the repair and construction of installation facilities. Before improvements were made, the installation had only a small cantonment, with some 4,600 barracks spaces located mostly in single story temporary buildings, 18 company-size dining halls, and one 1,000-man consolidated mess hall. Of the 1,006 buildings and structures on base, roughly one-half were of World War II vintage, and many did not meet current "Volunteer Army" standards. The small Army airfield could not handle Air Force troop carrier aircraft. Provision for all of the needs associated with reactivating Fort Irwin contributed dramatically to cost overruns and the need for constant budget revision.[10]

Housing was a case in point. Preliminary studies indicated that there was adequate housing at Fort Irwin or in Barstow. However, the 506 housing units on the installation required extensive renovation. That done, a requirement would still remain to house 900 soldiers and civilians. But by late 1980, high interest rates had driven the cost of off-post housing to unaffordable levels for most enlisted soldiers. The solution was to build 454 new family housing units at Fort Irwin, at a staggering cost. Because the housing units would not be completed until 1983, the Army was forced to increase the variable housing allowance for personnel assigned to the NTC.[11]

Nor was housing the only budget destroying culprit. FORSCOM engineers had assumed that the facilities and utilities at Fort Irwin would require only minimal repair, but detailed surveys in the fall of 1979 proved that desert conditions had taken their toll. Badly corroded water and gas pipes had to be replaced; kangaroo mice had destroyed the insulation on electric wires. In addition, new construction projects were planned for troop barracks, a mess hall, a commissary, recreational facilities, a fire station, an ammunition supply point, a railroad spur from Barstow, command and administrative buildings, and a new water deflouridization plant. Roads also had to be upgraded to meet defense access road standards. As a result, estimated costs for facility repairs and new construction escalated from $27.0 million in the FY 1982 budget to an estimated $299.4 million from May 1981 through FY 1987. At the end of 1984 several projects were still subject to deletion.[12]

Meanwhile, the NTC was not winning many friends in Congress. If the NTC was to be operational by the projected date of 1 July 1981, funds had to be provided out-of-cycle. By internal reprogramming of funds, the Department of the Army provided $5 million but had to go to Congress for an

---

10 Herndon, "National Training Center," pp. 41-43. (12) Department of the Army, *Final Environmental Impact Statement: National Training Center, Fort Irwin Site, Fort Irwin, California*, 19 January 1979, pp. A-47, A-59. In March 1979, General Rogers, in his testimony before the Defense Subcommittee of the Committee on Appropriations presented the following figures to Senator John C. Stennis, chairman:

FY 80	FY 81	FY 82	FY 83	FY 84	FY 80-84
$29.6M	$28.2M	$59.4M	$53.2M	$54.5M	$224.9M

U.S. Congress. Senate. Defense Subcommittee of the Committee on Appropriation. *Department of Defense Appropriations for Fiscal Year 1980*. 96th Cong., 1st sess., 1979, p. 839.

11 Herndon, "National Training Center," pp. 45-46.

12 Ibid., pp. 46-48.

additional $7.65 million for new construction. In September 1980, Congress reluctantly approved on the grounds that the Army had already located some troops and their families at Fort Irwin, but scolded the Army severely for its poor initial planning. Although some senior Army officials recognized that the NTC budget estimates were grossly inadequate, they believed that if the schedule was allowed to "slip," the high priority that was carrying the NTC through the budgeting system might also slip and result in a deletion of the program. Indeed, in his testimony before the Senate Subcommittee on Defense Appropriations in March 1979, General Rogers told Senator John C. Stennis (D-Miss.), chairman of the committee, that "Because Fort Irwin is already a Class I Army installation with sufficient land and extensive unused facilities, the estimated one-time costs of establishing the National Training Center at Fort Irwin are minimal."

Estimated costs, however, would continue to rise. In support of his aforementioned testimony in 1979, Rogers presented the following figures to Senator Stennis:

FY 80	FY81	FY82	FY83	FY84	FY80-84
$29.6M	$28.2M	$59.4M	$53.2M	$54.5M	$224.9M

Two years later, in April 1981, again in response to an inquiry as to the costs involved in the establishment of a NTC from Senator Stennis, the Office of the Chief of Staff of the Army provided the following figures ($ millions, may not add due to rounding): [13]

13 (1) U.S. Congress. Senate. Defense Subcommittee of the Committee on Appropriations. *Questions from Senator Stennis*. 96th Cong., 2d sess., April 1981, p. 949. (2) U.S. Congress. Senate. Defense Subcommittee of the Committee on Appropriations. *Department of Defense Appropriations for Fiscal Year 1980*. In 1983, Lt Col Herndon placed the actual expenditure for the NTC at $44.1 million in FY 1980; $82.6 million in FY 1981; and $174.1 million in FY1982. His figures were based on FY 1980 constant dollars.

[a] Operations and Maintenance - Army
[b] Other Procurement
[c] Research, Development, Testing, and Evaluation
[d] Military Construction - Army
[e] Family Housing Maintenance - Army
[f] FORSCOM identified an additional $4.3 million unfunded requirement for FY 80to rehabilitate existing family housing at Fort Irwin.
[g] FORSCOM identified an additional $16.2 million unfunded requirementfor FY 81 for repair and rehabilitation of Fort Irwin facilities,transportation of M551 Sheridans to Fort Irwin, and to provideinitial MCA at Fort Irwin.
[h] Identified additional OPA requirements for instrumentation procurement of $6.5 million for FY 82 and $0.1 million for FY 83.

	Reprogrammed						Total
	FY 80	FY 80	FY 81[f]	FY 82	FY 83	FY 94	FY 80-84
OMA[a]	14.7	+8.9	34.4	55.4	56.9	71.2	241.5
OPA[b]	10.3	0	4.8	2.3[g]	0.1[g]	0	17.5
RDTE[c]	0	0	0.5	0	0.5	0.5	1.5
MCA[d]	0	0	0	27.0	40.4	19.3	86.7
FHMA[e]	0	0[h]	4.5	39.6	9.7	1.2	55.0
	25.0	+8.9	44.2	124.3	107.8	92.2	402.2

The overt and organized top level support for the nascent NTC also coincided with a world political climate that helped calm some of its critics. In 1979, religious upheaval in Iran resulted in the anti-American Ayatollah Khomeini replacing the Shah as head of state. The presence of this unfriendly regime seemed to threaten the flow of crude oil through the Persian Gulf. Several months later—in December 1979—the Soviets moved into Afghanistan, Iran's eastern neighbor, exacerbating the concern that Soviet troops might also move upon or coerce the oil producing Gulf states. That situation especially influenced NTC critics who had argued that the terrain at Fort Irwin in no way resembled that of Western Europe. The NTC terrain did closely resemble that of Iran and the Middle East, which now was rapidly becoming a major area of contingency force operational planning. In addition, as noted above, the period from 1979 to 1983 saw a short-lived but important national consensus that defense had been seriously under-resourced during the drawdown after Vietnam. As a result, during the late Carter and early Reagan administrations, spending for defense saw significant increases.[14]

"Start-up" Difficulties

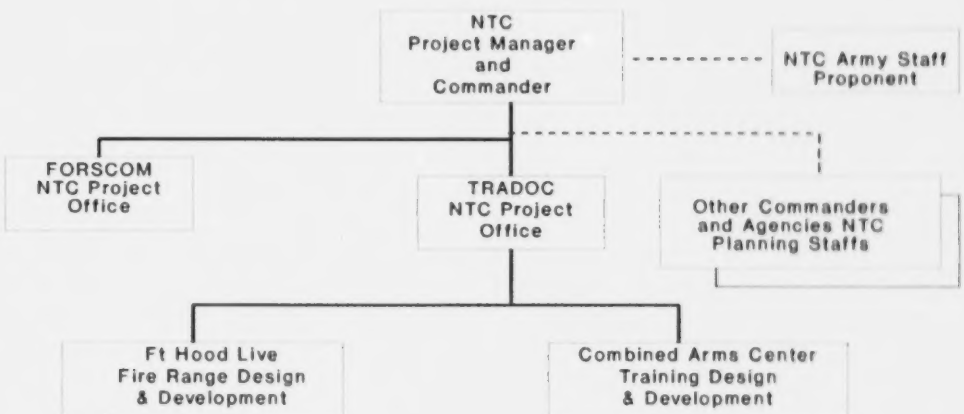
Ultimately, given an improved defense spending environment, it was the continued support of high ranking officers and civilians that allowed the NTC to open on schedule and survive its many setbacks in the early years of operation. The NTC was formally established on 16 October 1980, and Fort Irwin was reactivated on 1 July 1981. Late in 1979, Brig. Gen. James T. Bramlett had replaced Col. Lippencott as FORSCOM program manager and assumed control over all NTC actions. In October 1980 the Office of the Program Manager for the NTC at FORSCOM was transferred from

14 Herndon, "National Training Center," pp. 47-50. For FY 1979, the Carter administration supported a 5 percent increase in defense spending partly because of pressure from former Secretary of State Henry Kissinger, Senator Sam Nunn, and Senator John Tower. Those top level advocates of increased military spending advised Carter that without increased spending the strategic arms treaty would be useless, and, in any case, he would have trouble gathering the necessary support for its approval. Budget authorities approved $128.7 billion for FY 1979. For FY 1981, the Senate approved a record $161 billion; that figure rose to $178 billion for FY 1983. *New York Times*, 18 Sep 79.

the Office of the Deputy Commanding General to Fort Irwin, and Bramlett was designated the first commander of the National Training Center. At that time, the FORSCOM program manager's office was discontinued. Meanwhile, the newly appointed chief of the TRADOC Operations Group, Col. S. Price Darling, reported to Fort Irwin in October 1980 after spending two months at the Combined Arms Center for orientation. Table 2 shows the final planning organization of the NTC:

Table 2
NATIONAL TRAINING CENTER FINAL PLANNNING ORGANIZATION

November 1979

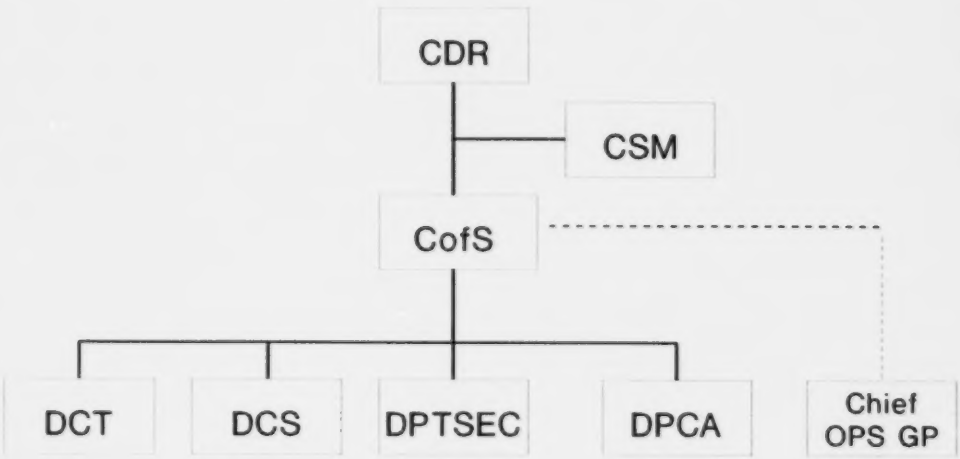


Source: Lt Col Robert L. Herndon, "The Army's National Training Center: A Case Study in Management of a Large Defense Project" (M.S. Thesis, Massachusetts Institute of Technology, 1983), p. 51.

Beginning on 1 October 1981, Boeing Services International began performing installation support functions at Fort Irwin. After more than four years of planning, which had involved many organizations in the Army, numerous federal agencies, state and local governments, private interest groups, and contractors, the NTC was a reality.[15]

The FORSCOM staff at the NTC, as indicated above, was led by a commander of the rank of brigadier general (Table 3).

Table 3
NTC PRIMARY STAFF



Source: William L. Shackelford, "NTC Perspectives," 1984 (unpublished study; graphics used with permission of the author)

15 (1) Herndon, "National Training Center," pp. 36, 44. (2) FORSCOM Annual Historical Review, FY 1981, p. 33. (SECRET—Information used is UNCLASSIFIED) (3) Memo, Brig Gen Crowell, DCST, to General Starry, Cdr TRADOC,through Maj Gen Blount, CofS TRADOC, 6 Aug 80, subj: Where are We?. (4) Department of the Army General Order GO-16, 22 June 81, changed Fort Irwin's status from that of a subpost of Fort Ord to an active Army installation as of 1 July 81.

The NTC chief of Staff served also as deputy commander of the NTC. Under the chief of staff were four deputies responsible for FORSCOM's various functions at Fort Irwin. The Deputy Commander for Training (DCT) commanded the two OPFOR battalions. The Deputy Commander for Support (DCS) served as principal advisor to the commander in matters pertaining to maintenance and logistics support. He was also responsible for monitoring the maintenance services provided by Boeing and for estimates of the number of vehicles units would need to provide from home station. Coordination of the arrival and departure of units and the issuing of training ammunition, MILES, and obstacle materials fell to the Deputy for Plans, Training, and Security (DPTSEC). The Deputy for Personnel and Community Affairs (DPCA) assisted units in Red Cross support and safety matters. The Chief of the TRADOC Operations Group was also aligned under the commander and served as executive agent for the conduct of training and as principal advisor to the NTC commander in matters concerning training.[16]

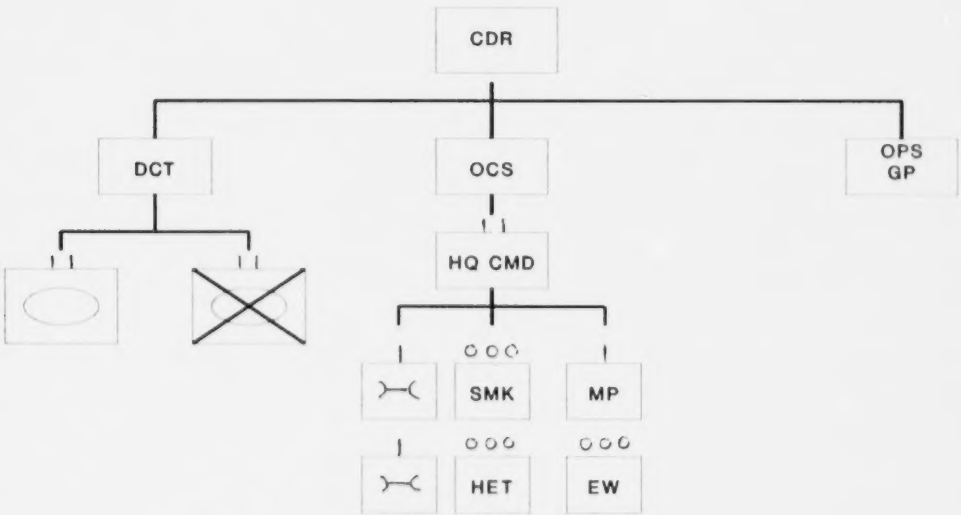
Support units at the NTC included two support maintenance companies that provided general support for the maintenance battalion that deployed as a part of the brigade slice and ran the repair parts activity (Table 4). To provide smoke on the battlefield during force-on-force maneuvers, a smoke generator platoon was assigned to the NTC. In addition to those units, an electronic warfare detachment provided the OPFOR with the capability to monitor, intercept, and jam Blue Force radio signals. All units involved in the support of training were under the operational control of the TRADOC Operations Group during training periods.[17]

Although the TRADOC Operations Group was aligned under the NTC commander, it had its own internal organization. The Group Headquarters included a small administrative and support staff to manage personnel and conduct administrative, logistical, and organizational maintenance activities. It also included a support section responsible for the maintenance and repair parts supply for the tracked vehicles assigned to the Operations Group (Boeing provided that service for the wheeled vehicles) (Table 5).

The Plans and Operations Division was made up of two scenario development teams and a live-fire section responsible for execution of live-fire training. In addition to designing the training scenarios, the scenario development personnel also provided exercise management control (EMC) to assure that maneuvers were carried out according to higher headquarters plans and orders. And they also prescribed time schedules, event lists, and OPFOR directives. The exercise management controllers monitored brigade and task force activities to insure that the scenarios were carried out as they were designed. They also played the role of a fictional division headquarters, assuming the functions of the "52d Mechanized Infantry Division," to provide command and control information from a notional division level tactical operations center. That function was a departure from the original concept as stated in the NTC Development Plan which called for the EMC to play the

16 Shackelford, "NTC Perspectives," pp. III-1 to III-5.
17 Ibid., pp. III-3 to III-5.

Table 4
NTC MAJOR UNITS



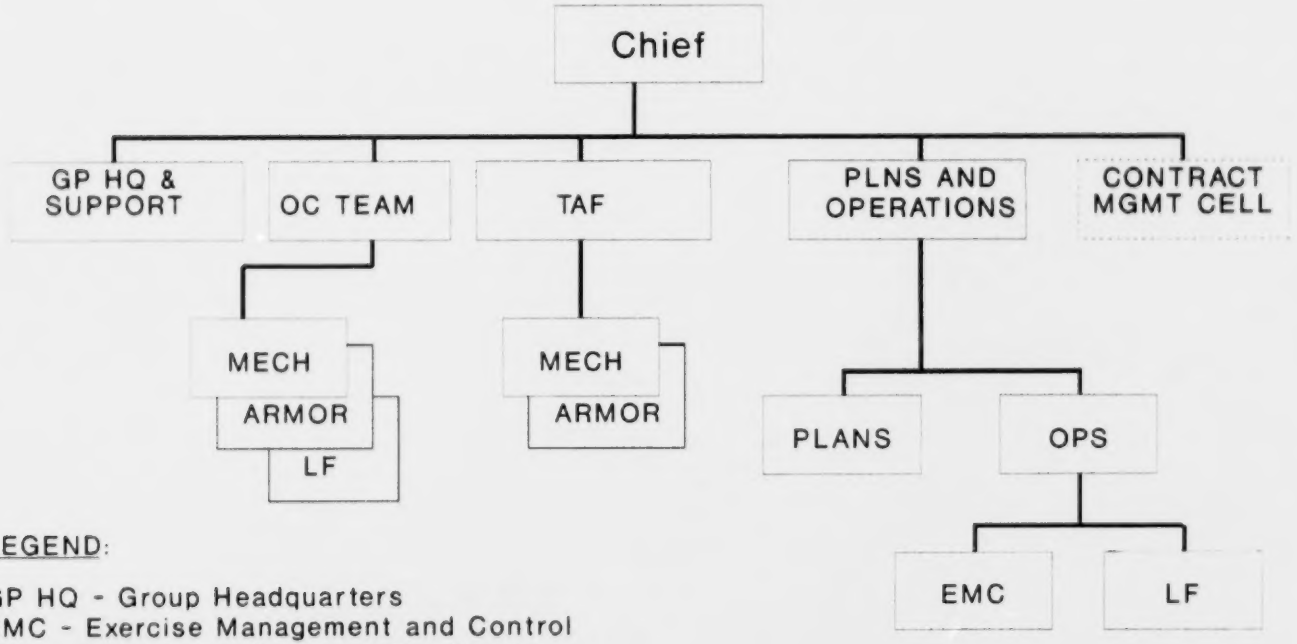
Source: William L. Shackelford, "NTC Perspectives," 1984 (unpublished study; graphics used with permission of the author), p. III-4.

controlling brigade headquarters for the two maneuver battalions. The revised concept allowed the parent brigade to execute its mission-related tasks and also undergo tactical training.[18]

A Training Analysis and Feedback (TAF) Division consisted of two training analysis teams operating in separate but identical facilities. One team was devoted to the analysis of armor battalion task force performance and the other to mechanized infantry. The TAF Division also contained an audiovisual section. That division was responsible for operation of the instrumentation system and field audio and video and for the recording of training data to be used in preparing AARs and take home packages. The senior TAF officer of each analysis team coordinated directly with the senior observer-controller (OC) who accompanied the task force during the battle to direct the building of the AAR as the battle unfolded. Six company analysts (A, B, C, D, AT [antitank company], and HHC) observed the activities of their respective units in the field and maintained contact with the OCs. Other analysts watched the actions of task force elements involved in the respective task force operating system. Analysis of the effectiveness of the task forces' fire support systems and the

18 Ibid., pp. IV-4, V-6.

Table 5
NTC TRADOC OPERATIONS GROUP - EARLY ORGANIZATION 1982-84



LEGEND:

GP HQ - Group Headquarters
EMC - Exercise Management and Control
TAF - Training Analysis and Feedback
LF - Live Fire

Source: Information from Col (Ret) William L. Shackelford, TRADOC Operations Group, NTC, 1982-1984.

provision of indirect fire battlefield effects was the responsibility of the artillery TAF personnel. Those analysts orchestrated and monitored both OPFOR and Blue Forces fire missions and worked closely with the fire support OCs in the field. Upon determination that supporting batteries and battalions were within range and ammunition was available, the artillery analysts notified the field OCs or fire markers to mark artillery and mortar impacts.[19]

Working outside the Operations Center but also a part of the Operations Group was an Artillery Division which included the fire markers mentioned above. Artillery Division personnel used air and ground burst simulators to mark simulated field artillery fire and pyrotechnics to mark chemical strikes and cannon-delivered antiarmor scatterable mines for the Blue Forces. They also directed the smoke platoon in the placement of smoke generators and evaluated and monitored fire support plans and employment. Although the marking of artillery fire for the OPFOR was left to the OCs, Artillery Division coordinated that activity by passing instructions to them.[20]

Also operating in the field was the Live Fire Division which directed operations at the live-fire range, maintained the facilities, and coordinated activities with the contractor, AMEX Corp. From a control bunker, live-fire teams controlled the target array via computers to insure that the presentation of targets met the unit's tactical training objectives. They also coordinated range activities with the observer-controllers accompanying each training unit and with the tactical operations center personnel responsible for command and control functions. The last two elements of the TRADOC Operations Group, the observer-controllers and the contract management cell, are discussed at some length elsewhere in this study.[21]

In the summer of 1981, the Operations Group assumed responsibility for the planning, conduct, and evaluation of training at the NTC. The breaking-in period was slow. During the remainder of 1981, only two rotational training periods were conducted at the NTC. The training neither had the benefit of maneuvers against an opposing force nor of the planned instrumentation. OPFOR training was not complete, a situation that delayed OPFOR fielding until early in 1982. Delivery of the instrumentation equipment and software had also been delayed. The circumstances surrounding the instrumentation delays will be discussed in the following chapter. Training in the two initial rotations consisted of one battalion conducting tactical operations against its sister battalion. Despite the "down-scaled" nature of the initial NTC rotations, they served to reveal a myriad of problems in the implementation process, especially with regard to the Operations Group and the instrumentation system. Col. William L. Shackelford, who took over as Chief of the Operations group in January 1982, would later describe the situation at Fort Irwin as "chaotic." There were fears abroad that the

19 Ibid., pp. III-1 to III-3.
20 Ibid, p. IV-5.
21 Ibid., pp. IV-5 to IV-7. See below, pp. 71-73 and 62-63 for discussion of the observer-controllers and the contract management cell, respectively.

NTC was too costly and that training would depart from the ARTEP "train-evaluate-train" philosophy. In that case, NTC developers feared that the NTC might become a testing ground for battalion commanders rather than a place where training deficiencies were identified and rectified.[22]

The Operations Group, too, encountered multiple difficulties. In the absence of guidance documents, training evaluation suffered when AARs were unstructured and weakly presented. In addition, members of the group had difficulty establishing satisfactory communications in putting together an organization that had few if any precedents. Writing in December 1981, the director of the Unit Training Directorate (UTD) of CATRADA observed that the group did not "deal effectively on a day-to-day basis with the NTC staff and other post agencies, including the OPFOR battalions. As a result, mutual understanding and agreement regarding roles, missions, capabilities and limitations has not been attained." After his first visit to the NTC in September 1981, Brig. Gen. Frederic J. Brown, III, TRADOC Deputy Chief of Staff for Training (August 1981 - January 1983), found himself in agreement with the UTD director. He was impressed with the live- fire range and with plans for instrumented engagement simulation, but he believed TRADOC had not done nearly what the command needed to do with regard to training. As he expressed it to Lt. Gen. Howard Stone at CAC, "on a scale of 0 to 10, I would rate our support effort at about 3 or 4 in terms of what needs to be done." The situation was further exacerbated by the physical separation of UTD at Fort Leavenworth and the Operations Group at Fort Irwin. Part of the problem was that the Group Headquarters was perpetually understaffed as a result of a decision to keep the headquarters austere rather than draw down support to some other mission essential task in the face of personnel shortages. That decision in turn damaged the credibility of the Operations Group and the entire NTC concept. In the midst of the start-up problems, in January 1982 Col. Shackelford replaced Col. Darling, as Chief of the TRADOC Operations Group. Prior to his assuming his position at Fort Irwin, Col. Shackelford was carefully briefed at Fort Leavenworth to assure that he was aware of the situation at Fort Irwin. Then, in June of that year, Brig. Gen. Thomas F. Cole replaced Brig. Gen. Bramlett as NTC commander. Planners clearly realized and admitted the NTC was not living up to expectations; at the same time, they were determined to move "full speed ahead" to head off any suggestions that the entire project was a mistake and should be canceled.[23]

Col. Shackelford, the new "ops group" chief, was, in the words of one student of the combat training centers program, "outspoken, opinionated and passionately committed to the Army in general and the NTC idea in particular". Writing about his experiences several years later,

---

22 The 197th Infantry Brigade (Separate) trained at Fort Irwin in August 1981; the 2d Brigade, 2d Armored Division trained during November 1981, Ibid.,pp. I-1, VI-1. For a lengthy list of the problems revealed by the August 1981rotation, see NTC Issues and Recommendations, attachment to memo, Capt DonaldChase (NTC project officer at the NTC Division, Unit Training Directorate,CATRADA, CAC) to Lt Col Northrop [September 1981].

23 (1) Shackelford, "NTC Perspectives," Acknowledgment, pp. I-1, II- 5 to II-6; IV-1. (2) Memo ATZL-TDD-U through DCDR CATRADA, Lt Col L. M. Grant, Director UTD, for Cdr CAC, 8 Dec 81, subj: NTC Liaison Visit, 29 Nov - 4 Dec 81(quotation).(3) Msg, Brig Gen Brown to Lt Gen Stone, 301900Z Sep 81, subj: National Training Center Operations Group. After the announcement that Col Darling would leave his position as Chief of the TRADOC Operations Group at the NTC, it took more than four months for MILPERSCEN to name his replacement.

Shackelford described the "chaotic" situation he found at Fort Irwin early in 1982, a situation that provided "little firm foundation to conduct training with the professionalism required." In his words, "The credibility of the NTC was paramount. There was extreme pressure early in the formation of the NTC . . . to question the cost effectiveness of the NTC. Outsiders who could not relate training benefits and those who had a jaded view of unit tactical training proficiency were unhesitant in their attacks against the NTC." Beginning in January 1982, Col Shackelford established guidelines meant to bring respectability and professionalism to the TRADOC operations element. In that endeavor, he gave much credit to the talents of Brig. Gen. Cole. Over the next three years, Shackelford presided over the efforts of the Operations Group to improve training management and evaluation, establish tighter structuring and clearly fixed responsibilities, assure careful selection of personnel, and provide better training for Operations Group assignees.[24]

The story of the Operations Group's further problems with the assignment of personnel is particularly revealing of the situation Col. Shackelford encountered when he arrived at the NTC on 5 January 1982. Further, it sheds some light on the difficulties the two major commands had from time to time in coordinating their efforts to put the NTC "on line." In April 1980, CAC had begun, at the direction of TRADOC headquarters, to prepare a Personnel Management Plan (PMP) for the NTC Operations Group. At that time TRADOC's plans called for the assignment of 229 personnel (103 officers, 91 enlisted soldiers, and 35 civilians), all of whom were to be placed on the CATRADA TDA, at least until the end of Phase I, scheduled for late 1984. TRADOC schools would initially provide 19 officers, 17 of whom would be permanently assigned to the NTC in June 1981. The NTC commander and the Chief of the Operations Group would report in the fall of 1980. The first problem arose from CAC expectations that all 229 persons would be assigned immediately. The Military Personnel Center (MILPERCEN), however, had planned to spread out assignments over a four year period, that is, through fiscal year 1984. MILPERCEN further established a policy of using the entire fiscal year to bring assignments up to designated strength for the year.

The issue was further complicated by FORSCOM when that command decided in FY 1981 to train the two battalions present for each rotation concurrently. The NTC development plan had envisioned that initially the Operations Group would train only one battalion task force at a time through FY 1984, and staffing for the group had proceeded on that assumption. However, in the fall of 1981, FORSCOM announced that each rotation would consist of two task forces training simultaneously, with a brigade headquarters. In the absence of sufficient instrumentation, only one battalion would be instrumented. Concerned personnel from TRADOC strongly objected to FORSCOM's action and attempted to explain the phased nature of the development plan and TRADOC's inability to fully support the Operations Group under the new plan. It may be remembered that FORSCOM had never officially acknowledged the development plan that TRADOC had

24 Shackelford, "NTC Perspectives," Acknowledgement, I-1 (2d quotation), IV-9, (3rd quotation), VI-1. (2) First quotation is from Rodler F.Morris, "A History of the Joint Readiness Training Center," Vol I: "Creating the Blueprint for the Original Institution, 1973-1987" (U.S. Army Combined Arms Center History Office,1990) [publication is scheduled in 1992], p. 193.

drawn up. Reporting on TRADOC's efforts to explain the difficult position the command would encounter, the NTC Project Manager at Fort Leavenworth wrote that too many people took a " 'we' versus 'they' attitude," a situation which resulted in the Operations Group feeling "very frustrated because they are caught 'in-between'." In any case, the necessary personnel would not be available in time to meet the training requirements. In addition, the lack of instrumentation during the early rotations increased the need for personnel to manually manage, support, and control the exercises. In effect, the Operations Group started out nearly a year behind and continued to operate understrength during the crucial development and implementation process.[25]

Meanwhile, in response to concerns among the TRADOC and CAC staffs and the general officers involved in NTC development, the NTC Division of UTD at CATRADA began a reevaluation of the size and structure of the Operations Group. Of special concern was the possibility that the TRADOC group would be too small to support the annual rotation of forty-two battalions by FY 1984. As a consequence, the NTC Division, after consultation with Brig. Gen. Bramlett, recommended the TDA be increased to 204 officers, 290 enlisted personnel, and approximately 35 civilians, by FY 1984. The CAC commander, Lt. Gen. William R. Richardson, approved the plan, and the TRADOC commander, General Starry, requested the necessary funding.

During 1981, CAC officers kept constant pressure on MILPERCEN to fill the officer and enlisted authorizations of the Operations Group. In the opinion of the UTD director, filling the spaces proved difficult because many officers " being alerted do not want to go to the Operations Group because it is a TRADOC organization and they prefer to go to the FORSCOM side of the house." Things gradually went from bad to worse. MILPERCEN announced it could fill only 82 percent of the military authorizations for FY 1982. Without the full complement, the TRADOC element could not meet all its requirements for the November 1981 training cycle, the January 1982 initial operational capability test, or for contractor training of newly assigned personnel.

---

25 (1) CAC Annual Historical Review, FY 1981, p. 98. (2) Ltr, 1st Lt. Jenny Sidri, Asst AG, CAC, to distr, 5 Aug 80, subj: Personnel Management Program for the NTC Operations Group, with enclosures. (3) Memo ATZL-TDD-U, Col Virgil S. Fernandes, Director UTD, CATRADA, CAC, to DCDR CATRADA, 3 Sep 81, subj: UTD Participation in the August NTC Rotation w/encls. (4) Ltr, Brig Gen James T.Bramlett, Commander NTC, to Lt Gen Howard F. Stone, Deputy Commander, U.S. Army Training and Doctrine Command, 18 Sep 81, subj: Request forAssistance.(5) Memo ATZL-TDD-N, Capt William C. Puddy, to Chief, NTC Division, UTD, 23 Nov 81, subj: Inplant Training, 16-20 Nov 81 (quotation).(6) Memo ATZL-TDD-U thru DCDR, CATRADA, for Cdr CAC, 8 Dec 81, subj: NTC Liaison Visit, 29 Nov - 4 Dec 81. (7) Decision Paper ATZL-TDD-N through DCDR, CATRA-DA, to DCG for Combined Arms [TRADOC], 11 Dec 81, subj: Support for NTC. (8) TRADOC's, and CAC's, difficulties in staffing the NTC Operations Group were compounded by the simultaneous development of a High Technology Test Bed (HTTB) for light motorized forces at Fort Lewis. In that endeavor the command encountered similar problems with MILPERCEN that made it necessary to take assignment of officers "out of hide." Records, Office of the Command Historian, HQ TRADOC.

To help the Operations Group meet its obligation, the CAC commander, Lt. Gen. Howard F. Stone, who had succeeded Lt. Gen. Richardson, asked the Soldier Support Center, the Armor Center, and the Infantry Center to send a total of eight military personnel to Fort Irwin on a temporary basis to support the training scheduled for November. Because that arrangement proved too costly to serve as a long-range solution, the CAC commander requested that TRADOC headquarters take steps to establish a separate TDA for the Operations group. That action would, in effect, give the TRADOC NTC element higher priority at the Department of the Army level for personnel actions. Concurrently, a number of agencies concerned with NTC staffing established a working group to revise the Operations Group TDA. Among other changes, they recommended that some authorizations scheduled for FY 1983 and 1984 be moved back into FY 1982. The personnel situation gradually improved through a combination of increased efforts at MILPERCEN to fill vacant positions expeditiously and the assignment to the NTC of temporary duty personnel from selected TRADOC schools and centers. By the time Col. Shackelford left his position as Chief of the Operations Group in September 1984, the group was authorized a total of 510 spaces, most of which were filled.[26]

The severe shortage of personnel to fulfill the responsibilities of the TRADOC trainers at the NTC also affected the writing of scenarios. Originally UTD was to perform that task and did so at least until March 1982. By that time, however, training developers at CAC realized they could not produce a "ready-to-implement package." The product they produced required fine-tuning on the scene at Fort Irwin. There was also a strong need to educate those who would execute the training. They finally concluded that the Operations Group could more efficiently and effectively write its own training scenarios. By way of assistance, a UTD team was assigned to Fort Irwin to aid the resident Operations Group. Even that solution proved invalid, however, when the Operations Group could not release enough people "from the exigencies of the moment to plan for the future," as the UTD director described the situation. Ultimately, the Operations Group did assume responsibility for scenario development, but only after sufficient personnel were available for that function and for the planning and conduct of training as well. In March 1982, CAC commander Stone provided his assessment of the situation at the NTC for TRADOC commander General Glenn K. Otis: "I feel we have made significant progress with the NTC, and once the required personnel are on board, everything else will fall into place." While "everything else" falling into place did not prove that easy, solution of the problem of personnel for the Operations Group went a long way toward defusing the atmosphere of criticism and cynicism that haunted the NTC in its early days.[27]

---

26 (1) MFR, Col Virgil S. Fernandes, Director, UTD, CATRADA, CAC, 24 Apr 81,subj: NTC Operations Group Personnel Fill for Officers (quotation). (2) Msg, Cdr CAC to Cdrs U.S. Army Soldier Support Center, U.S. Army Infantry Center, and U.S. Army Armor Center, 131345Z Oct 81, subj: Support for November NTCUnit Rotation. (3) Decision Paper ATZL-TDD-N through DCDR, CATRADA, to LtCG forCombined Arms Training [TRADOC], 11 Dec 81, subj: NTC Support. (4) Shackelford, "NTC Perspectives," pp. II-5 to II-6. (5) Msg, DCDR TRADOC to distr,181545Z Dec 81, subj: Support for National Training Center.

27 (1) Memo ATZL-TDD-U through DCDR, CATRADA, Lt Col L.M. Grant, Jr., Director UTD, to Cdr CAC, 8 Dec 81, subj: NTC Liaison Visit, 29 Nov - 4 Dec 81(1st and 2d quotations). (2) Ltr, Lt Gen Howard F. Stone to General Glenn K. Otis, 8 Mar 82, subj: [Annual Assessment of CAC Priority Efforts for 1981].

During most of Shackelford's three year tenure as Chief of the Operations Group at the NTC, reform efforts were made all the more difficult by reorganization efforts at the Combined Arms Center. Under NTC development and implementation plans, the Combined Arms Training Development Activity's (CATRADA) Unit Training Directorate had overall responsibility within CAC for development of the NTC. UTD's responsibilities, which as we have noted were discharged through its NTC Division, included managing the formation of the Operations Group, developing the Opposing Force Program, coordinating the live fire exercises, overseeing the writing of scenarios, devising the after action reviews, and other related actions. The directorate was also responsible for acquiring the instrumentation contracts. From 1978 to the spring of 1980, the CATRADA commander, a brigadier general, reported directly to the major general commanding the Combined Arms Combat Developments Activity (CACDA), who in turn acted as deputy commander of both agencies for the CAC commander. In April 1980, CAC commander Lt. Gen. William R. Richardson, (October 1979 - July 1981), who had a strong commitment to training development, approved reorganization of CATRADA as a new mission activity. That action thus freed CATRADA from the CACDA chain of command in the early days of training and instrumentation development at the NTC.

That favorable situation changed in late 1982. In December of that year, CATRADA was disestablished and its training directorates realigned under the Command and General Staff College. The realignment appears to have been the result of the tendency of some senior officers at TRADOC headquarters and at CAC to subordinate the needs of training to those of the analytical community. In any case, for nearly two years the training directorates played second fiddle to the CGSC's traditional and established missions. It was also a period in which the CGSC experienced almost an exponential growth of missions, courses, and programs, including the rapid expansion of the Combined Arms and Services Staff School and the establishment of the Advanced Military Studies Program, later to be retitled the School of Advanced Military Studies. By 1984, the deputy commandant of the CGSC had assumed supervisory responsibility for twenty-five college agencies and directorates.

The turbulence created in the Fort Leavenworth agencies responsible for training development had a severely detrimental affect on the Operations Group at Fort Irwin as it struggled to establish a new and untried training system for the Army. Finally, in April 1984, General Richardson, by then TRADOC commander, declared the Leavenworth organizational decisions of late 1982 to have been fundamental mistakes. As a result, in July 1984, the training directorates which had joined the college upon the demise of CATRADA, as well as the jurisdiction for the NTC Operations Group, were both separated from the CGSC and formed directly under CAC headquarters into the Combined Arms Training Activity, known throughout the Army as CATA. By that time, Brig. Gen. Cole, Col.

Shackelford, and the other senior members of the Operations Group had managed to solve many of the "start-up" problems of the TRADOC operations at Fort Irwin.[28]

Meanwhile, the increase in the TDA for the TRADOC unit at the NTC was, among many other things, causing major headaches for FORSCOM. Although funding problems had not proved fatal for the new National Training Center, cost overruns continued to plague the NTC throughout its phase I development. The overruns were, in part, responsible for the abandonment of initial plans to train forty-two battalion task forces there per year. As we have seen, NTC planners believed that level of participation was necessary if all battalion commanders were to train at the training center during their tour of command. The initial FORSCOM Program Analysis and Resource Review (PARR) submission developed for support of the NTC (FY 1980-1984) had requested dollar and manpower resources based on the provision of 14-day training exercises for 10 battalion task forces in FY 1980 - FY 1981, 20 task forces in FY 1982 - 1983, and 42 task forces in FY 1984 and beyond. FORSCOM calculated its personnel requirements to be 1,918 military and 224 civilian. In the next PARR submission (FY 1981 - FY 1985), Forces Command requested additional dollar resources to support emergency spectrum management operation, a temporary airfield in FY 1981, military construction funds for bachelor enlisted quarters, a permanent airfield in 1983, and additional base operations support for an increase in military personnel to 2,505. Total additional funds requested for the FY 1981 - 1985 PARR period amounted to $77.1 million. The FY 1982 - 1986 PARR submission gave "priority one" rating to base operating support for the NTC. That action provided additional resources in the amount of $8.5 million for FY 1982 and allowed the activation of Fort Irwin on 1 July 1981, as scheduled.[29]

As the number of military personnel assigned to Fort Irwin increased and new construction was completed, additional funding was required for maintenance, family housing operations, and other base operations support. The necessity to ship more equipment from home station than originally planned drove up the cost of the prescribed training further. The equipment in question was either not available as in the case of the Vulcan gun systems or the rotating units had recently modernized. Some had received their new M1 tanks and Bradley Fighting Vehicles, while the center had not received any. In addition, the cost of the contract with Boeing Services International to provide a base support package continued to rise, due in part to a statement of work that had not included all the functions that would have to be performed. To make matters worse, the contract between Boeing and the Teamsters Union which represented most of the employees, provided for a 9 percent compensation increase each year. Taking into account all those factors, by the end of September 1981, NTC officials reduced the number of rotations planned in FY 1982 to 16 battalion task forces.

---

28 (1) CAC Annual Historical Reviews, FY 1980, pp. 141-44; 1985-1986, pp.45-46, 63-73. (3) CAC Annual Historical Review, 1982-83-84, pp. 9-10.(3) Ltr, Lt Gen Carl E. Vuono, Commander, CAC to General William R. Richardson, Commander, TRADOC, 29 Jan 85, subj: [End of Tour Report]. CATA also assumed proponency for the U.S. Army Element, U.S. Air Force Air Ground Operations School.

29 FORSCOM Annual Historical Review, FY 1980, pp. 69-70.(SECRET — Information used is UNCLASSIFIED)

At that point, 10 rotations (20 task forces) were still planned for FY 1983 and 42 for FY 1984. However, by the end of September 1982, FORSCOM and the NTC staff had concluded that the FY 1984 rotation schedule of 42 battalions might have to be reduced. A year later the number of rotations planned was reduced to twelve (24 task forces) annually.[30]

In addition to funding problems, plans for even twelve rotations in FY 1984 were hampered by the major Army-wide force modernization problems of the early 1980s. During 1982-1983, the first of the Army's heavy divisions began transition from the ROAD division tables of organization and equipment (TOE), which had first been implemented in their original form some twenty years earlier, to the division TOE's of Army 86. The ROAD division TOEs were based on the M60 tank and the M113 armored personnel carrier. Although some of the new weapons and equipment that the Army 86 organizations would use had already been fielded, the year 1983 saw the onset of what Army planners called the "bow wave" of the force modernization effort. During that period, the design and planning stages of Army 86 were giving way to the implementation phase as the M1 Abrams tank, the M2 and M3 Bradley Fighting Vehicles, the Multiple Launch Rocket System, and other new systems were fielded at a quickening pace. All that meant, in simple terms, that the conversion of the field units and National Training Center conversion to the Division 86 TOE were out of synchronization by early 1983. Matching the effective dates of conversion for both active and reserve component units with unit rotation dates proved very difficult. The problems caused by modernization were finally solved by allowing mismatched units to draw the new equipment, reconfigure that equipment, and train under the old ROAD configuration. With that arrangement in place, all twelve rotations planned for FY 1984 were completed. During that time most units were M60-M113 organizations. However, late in the year, elements of the 2d Armored Division completed the first modernized rotation with Abrams tanks and Bradley Fighting Vehicles.[31]

As the National Training Center approached the end of its third year of full operations, it had survived a number of setbacks and seemed well on the way to reaching its potential, given that its development plan was no longer as ambitious as in 1979. TRADOC and FORSCOM appeared to have made peace with the division of labor as spelled out in AR 350-50. The TRADOC Operations Group was nearing full staffing and had become the professional organization the NTC developers had envisioned. FORSCOM's temporary solution to the difficulties encountered as the result of rapid force modernization seemed sound. The establishment of CATA had given the NTC a more stable base at the Combined Arms Center. Considering the scope of the NTC project, funding, perhaps inevitably, would remain an issue. By the end of 1982, the average bill for one rotation at the NTC had reached just over $3 million. Nevertheless, NTC supporters still hoped to be able to

30 FORSCOM Annual Historical Reviews, FY 1981, pp. 205-06; FY 1982, pp. 208-09; FY 1983, p. 89. (All SECRET — Information used is UNCLASSIFIED)

31 (1) FORSCOM Annual Historical Reviews, FY 1983, pp. 204-05; FY 1984, p. 245; FY 1985, pp. 198-99. (2) TRADOC Annual Historical Review, FY 1983, p. 329. (All SECRET — Information used is UNCLASSIFIED)

train 42 battalions a year sometime in the future. Cost factors notwithstanding, when Brig. Gen. Cole and Col. Shackelford left their positions at the training center in 1984, its future as the centerpiece of the Army's training system seemed assured.

Chapter V

TRAINING EVALUATION AND THE INSTRUMENTATION SYSTEM

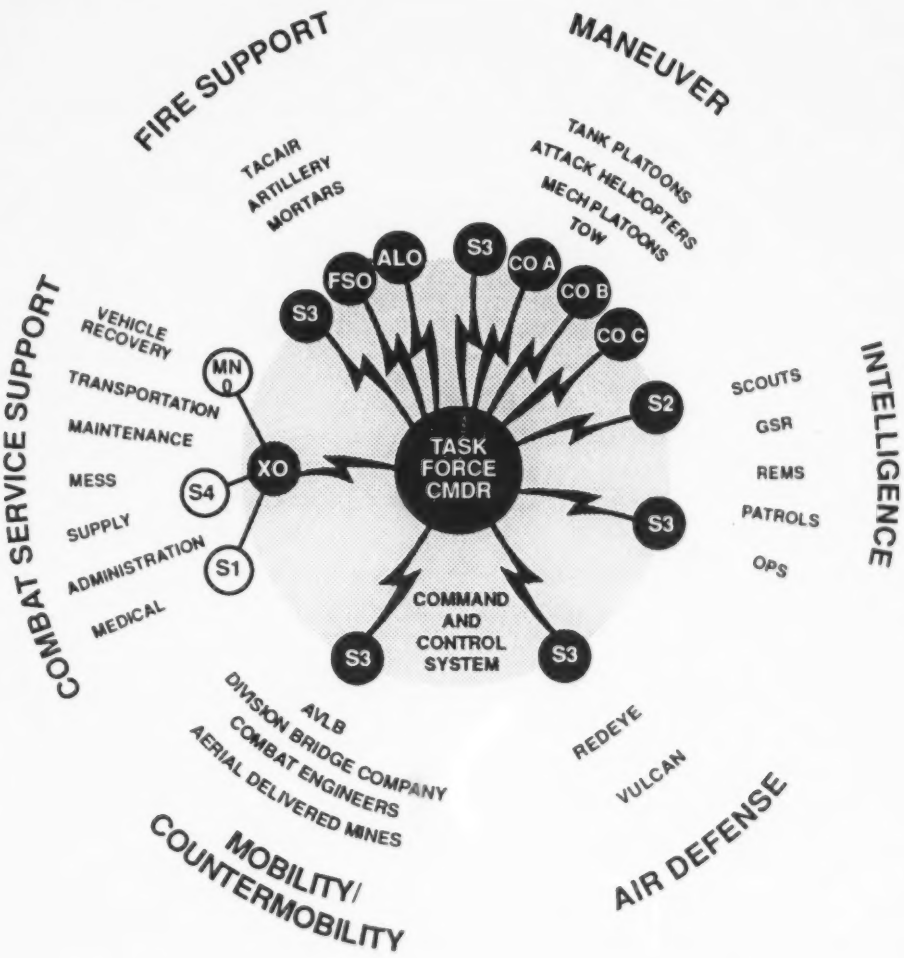
Development, Testing, and Delivery

NTC developers stressed two key objectives of the National Training Center. First, it needed to provide a realistic battlefield training environment for the battalion task force. Second, it needed to furnish a system of training evaluation that could objectively assess a unit's proficiency. A major weakness of the Army Training and Evaluation Program (ARTEP) was its lack of consistent, statistically reliable data to evaluate training effectiveness and improve subsequent performance. At the heart of the NTC concept was an instrumentation system that could collect, analyze, and integrate information from the battlefield. That data would then be used to provide after-action reviews and takehome packages for the rotating battalions. To make the best use of such sophisticated technology, however, required that evaluation criteria be carefully established. Analysis of measures of evaluation fell to the TRADOC training developments community, specifically to the Unit Training Directorate of the Combined Arms Training Development Activity (CATRADA) at the Combined Arms Center. Working with the TRADOC schools, CATRADA had identified eight (later, seven) "battlefield operating systems" as best reflecting the major functions of heavy battalion task forces on the battlefield. These battlefield operating systems were maneuver; intelligence; air defense artillery; mobility-counter-mobility; combat service support; fire support; nuclear, biological and chemical warfare (NBC); and command and control. NBC warfare was later combined with mobility-countermobility to become mobility and survivability (Chart 1). The systems approach to training evaluation made it relatively simple to group problems for ease of correction. The instrumentation system and the development of software had to address the full spectrum of the operational situations.[1]

---

1 (1) Furman and Wampler, "Methodology," pp. 44-46. (2) For a general discussion of the battlefield operating systems see Chapter 3, FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, July 1977. (3) Col Taft C. Ring, ADC-T for Maj Gen John R. Galvin, "The Evolution of the Training Strategy in the 24th Mechanized Infantry" Information Briefing, 27 May 83, pp. 9-10.

Chart 1
BATTLEFIELD OPERATING SYSTEMS



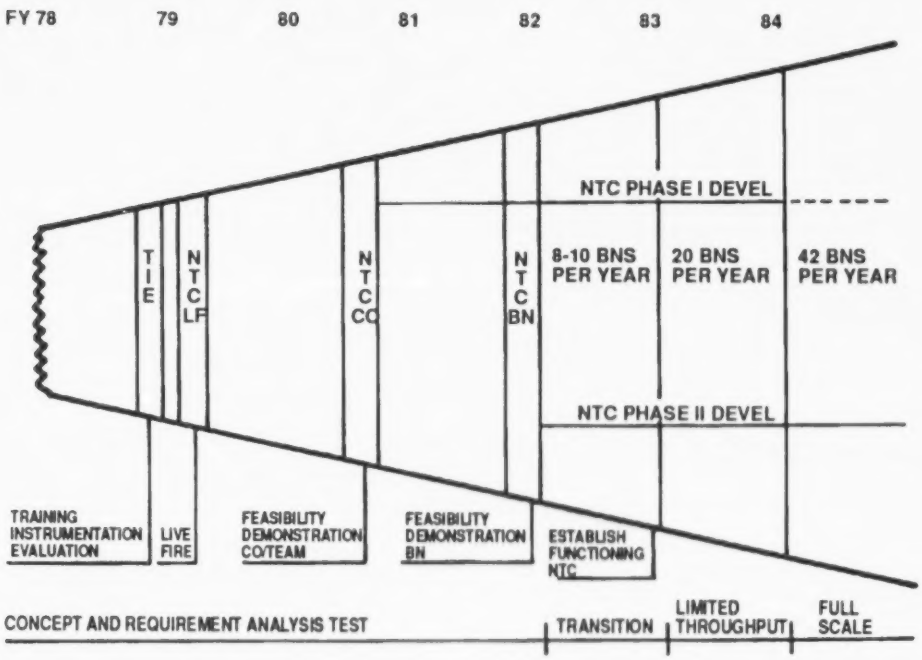
Source: FM 71-2, The Tank and Mechanized Infantry Battalion Task Force, (Sept 1988).

LEGEND

GSR: Ground Surveillance Radar
REMS: Remotely Employed Sensor
AVLB: Armored Vehicle Launched Bridge

In the development of a computer-based instrumentation system, TRADOC system managers planned a phased implementation designed to be evolutionary and to have the NTC operational at the earliest possible date. Phase I called for off-the-shelf equipment to support the rotation of up to twenty battalions a year. The second phase, to begin in FY 1985, would feature more sophisticated hardware, capitalize on the experience gained in Phase I, and accommodate the training of forty-two battalions annually. To minimize technical, schedule, and cost risks, several concept tests were conducted prior to implementation of Phase I. Even before final approval of the NTC development plan, TRADOC had begun initial exploratory tests to identify instrumentation and live-fire training requirements. A "training instrumentation evaluation" (TIE) took place from 10 August to 15 September 1978, and live-fire exercises were tested at Fort Hood in January 1979 (Chart 2).[2]

Chart 2
NATIONAL TRAINING CENTER
DEVELOPMENT IMPLEMENTATION STRATEGY



Source: Science Applications, Inc. for TRADOC, NTC Analysis Final Technical Report, March 1981.

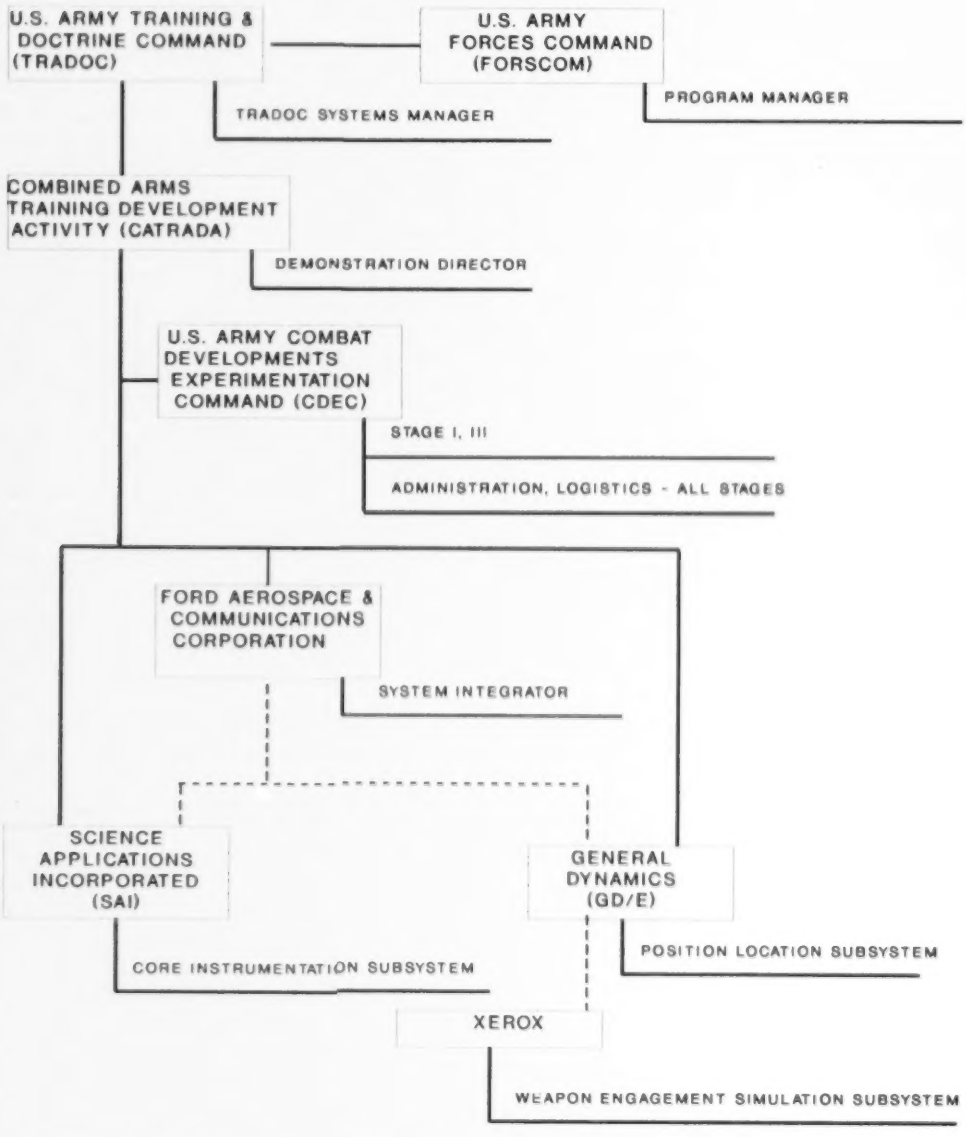
2 (1) NTC Development Plan, Apr 79, p. IV-10. (2) Semiannual Historical Reports, ODCST, Apr - Sep 78, p. 40; Apr - Sep 79, p. 29.

Meanwhile, in June 1978, the Army, through the Defense Advanced Research Projects Agency (DARPA), contracted with Science Applications, Inc. (SAI) to conduct a detailed "baseline analysis" of the NTC in order to define functional requirements and provide a program framework as an essential first step in laying the foundation for all subsequent instrumentation planning for the NTC. SAI presented the study to DARPA and TRADOC in September 1978. In a follow-up program known as NTC I-ALPHA or NTC1A, SAI designed and demonstrated the hardware and software for a prototype core instrumentation subsystem (CIS). That prototype was to consist of a central computer facility employing a matrix of minicomputers, microprocessors, graphic displays, and data storage capabilities. Because of schedule constraints and the remoteness of Fort Irwin, the prototype CIS was developed and tested at the Ford Aerospace and Communications Corporation (FACC) at Sunnyvale, Calif. Other instrumentation subsystems which would be involved in the NTC1A program were tested at various locations. In addition to SAI and FACC, contractor support for the NTC I-ALPHA program also came from General Dynamics/Electronics (GD/E), which was responsible for the installation and testing of a position location system, and from Xerox Electro-Optical Systems, developer of the Multiple Integrated Laser Engagement System, or MILES (Table 6). From 21 November 1979 to 31 March 1980 the first in a series of operational tests got underway with the CIS in limited engagement simulation exercises at Fort Irwin and Fort Hunter Liggett, Calif. CATRADA served as demonstration director, with administrative and logistical support from the U.S. Army Combat Developments Experimentation Command (CDEC) at Fort Ord, Calif. The success of the tests with company size forces lent credence to the soundness of the NTC concept and to the use of advanced computer technology for objective evaluation of training.[3]

The initial testing successfully completed, TRADOC commander, General Donn A. Starry, approved the NTC procurement plan 28 March 1980. Soon therefore TRADOC issued a request for proposals (RFP) on 7 July 1980, with contract awards scheduled for 11 August. But two weeks prior to that date, the Small Business Administration (SBA) identified the NTC instrumentation acquisition efforts as a Section 8(a) "set-aside" under Public Law 95-507. That action allowed the SBA to award the contract to small, disadvantaged, or minority businesses. Thereupon, AMEX Systems Corp., a minority-owned small business in California, examined the RFP. AMEX solicited support from SAI and GD/E in preparing its proposal. After a bidder's conference at TRADOC headquarters on 21 July, the Office of the Secretary of the Army, at the request of the Small Business Administration, directed that TRADOC examine a second proposal by OAO Corp., another small business. At the same time, the command provided the RFP to several large corporations for information in the event that SBA-supported businesses were unable to meet the technical requirements. The projected cost estimate for Phase I instrumentation at that time was $21 million. On 16 September the SBA

3 (1) SAI, Final Report, Mar 81, pp. 1-13 to 1-20, 3-16, 3-34. (2) Semiannual Historical Reports, ODCST, Apr - Sep 78, p. 40; Apr - Sep 79, p. 29; Oct 79 - Mar 80, pp. 33-34; and Apr - Sep 80, pp. 45-46. (3) Ford Aerospace and Communications Corporation, NTC1A Final Report, 20 May 80, p. 1-12. Loral Electrical Systems later took over the engagement simulation functions of the Xerox Corporation, including MILES development. The MILES developers then became known as Loral Electro-Optical Corporation.

Table 6
NATIONAL TRAINING CENTER
1A FUNCTIONAL STRUCTURE



Source: Ford Aerospace and Communications Corps., National Training Center Instrumented Training Demonstration (NTCIA) Final Report, 20 May 80, p. 1-15.

announced the selection of AMEX Systems as the prime contractor for the Phase I instrumentation. It may or may not have been significant that the owner and founder of AMEX, Manuel R. Caldera, had close ties to the White House. President Gerald Ford had appointed him to the Board of Directors of the Inter-American Foundation. President Jimmy Carter subsequently appointed Caldera to the Presidential Advisory Committee for Small and Minority Businesses. In 1983, Carter's successor, Ronald Reagan, named Caldera "Hispanic Businessman of the Year." In any case, the Army objected to the set-aside action and the subsequent award to AMEX, on the basis of the size and complexity of the project. Although AMEX chose SAI and GD/E as subcontractors for the development of the core instrumentation subsystem and the range data measurement subsystem, respectively, the episode set the procurement process back several months. On 6 January 1981, AMEX signed a contract for $26 million to deliver a 125-player instrumentation system by 31 January 1982, with options to expand to 500 players.[4]

The Phase I instrumentation system had originally been scheduled for delivery in July 1981, and NTC planners had expected to have it operational for the first rotations in August of that year. However, the difficulties associated with awarding the contract, as well as developmental problems, caused numerous delays. Because AMEX was not able to meet its January 1982 deadline, the first instrumented after action report was not produced until the fall of 1982, approximately a year after the NTC became operational. Given the size of the technical effort, that the instrumentation system struggled through its developmental phase was not unexpected. On the other hand, even after the conditional acceptance in June 1983 of the full 500-player system had marked the end of the Phase I procurement effort, leaders of the TRADOC Operations Group were disappointed that the system still had a number of serious deficiencies. As late as September 1984, the live-fire component still had not passed acceptance testing and was not the tool for performance measurement that TRADOC had expected. But, notwithstanding the fact that the system was slow to mature, its capabilities made it one of the most powerful training tools in history.[5]

When the Army accepted the 500-player instrumentation system, it also had to provide for monitoring the contractor's performance under an operations and maintenance contract. After examining several options, Col. William L. Shackelford, the chief of the TRADOC Operations

---

4 (1) Herndon, "National Training Center," pp. 41-42. (2) Systems Planning Corporation for TRADOC, National Training Center Phase I Acquisition and Development Support Final Technical Report, December 1980. (3) Semiannual Historical Reports, ODCST, Oct 79 - Mar 80, pp. 33-34; Apr - Sep 80, pp. 45-46. (4) *Los Angeles Times*, 5 Apr 1989. (5) Memo, Brig Gen Crowell, DCST, to General Starry, Cdr TRADOC through Maj Gen Blount, CofS TRADOC, 6 Aug 80, subj: Where are We?. (6) *Business Wire*, 13 Apr 87. Prior to the release of the RFP, TRADOC officials had considered adopting a system known as PLAFIRE (player-based force-on-force instrumentation for realistic exercises), which employed the integration of "off-the-shelf" components. As PLAFIRE was being tested in early 1980, the decision was made, however, that the engagement simulation system would require too much of a research and development effort, and, in any case, it would not be ready for use until at least July 1982. In addition, PLAFIRE did not have the capability to instrument 450-500 players, nor did it appear capable of covering a large exercise area. Ltr, Cpt. Timothy Reischl to General Starry, 15 Jan 80, Donn A. Starry Papers, U.S. Army Military History Institute, Carlisle Barracks, Pa.

5 Shackelford, "NTC Perspectives," p. V-1.

Group, and Brig. Gen. Thomas F. Cole, the NTC commander, determined the task could best be accomplished on site at Fort Irwin. The contractor had to be held accountable for quality assurance, correction of uncorrected deficiencies, and repair and maintenance of the system. Even in the face of its severe manpower shortages, the Operations Group formed a contract management cell in the summer of 1983 from its own TDA by redesignating some military and civilian spaces and transferring one officer space from TRADOC headquarters. However, soon thereafter General William R. Richardson, the TRADOC commander, decided that contract management should not be the responsibility of the command's NTC Operations Group. Instead he placed the contract management cell under the proponency of the NTC Chief of Staff. Personnel continued to be provided from the TRADOC Operation's Group TDA.[6]

The Instrumentation System Design

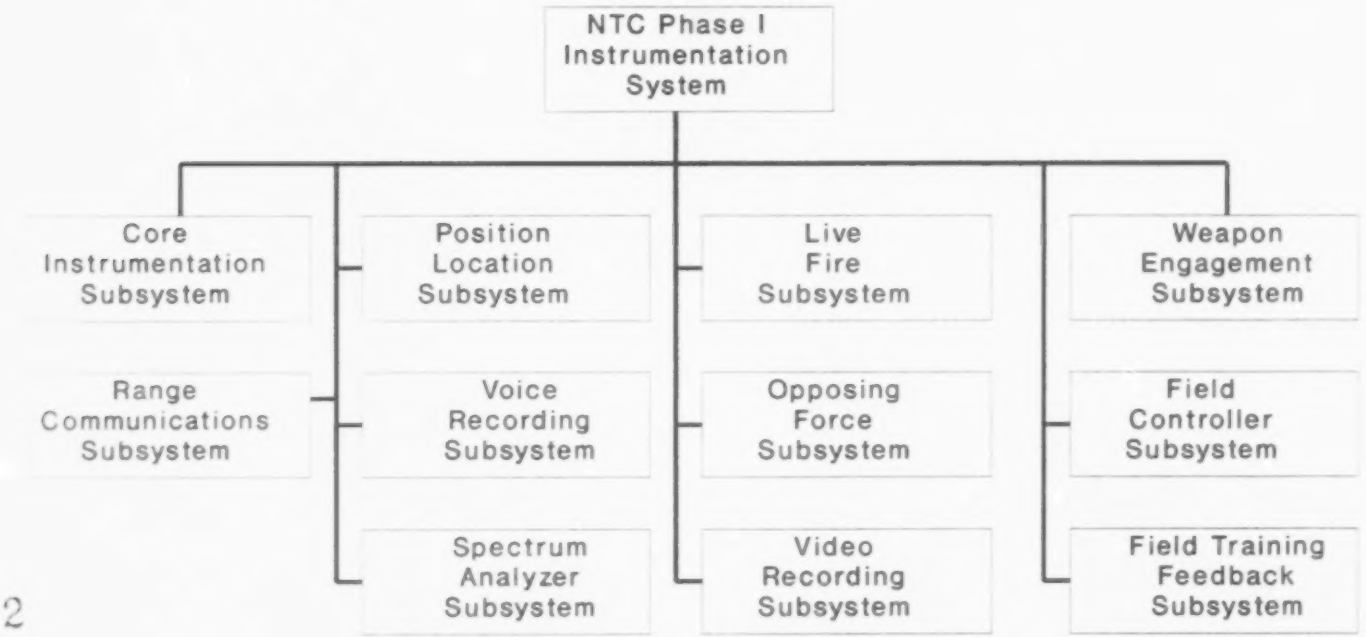
As designed, the NTC Phase I instrumentation system controlled the scenario, the operating environment, and the evaluation of a battalion's performance during the training cycle (Table 7). The core instrumentation subsystem (CIS), located in the TRADOC Operations Center near the cantonment area at Fort Irwin, was the central computer facility. It received all data input and served as the operating arena for the TRADOC exercise management and control teams and the training analysis and feed-back teams, as discussed in Chapter 4. Data were gathered from both force-on-force engagement simulation and live-fire exercises. Input to the data collection center was made in several forms: information received via the instrumented environment; video recordings of events by field cameras; data supplied by field controllers; and the monitoring and recording of radio networks. Three line-of-sight stations located on small hills in the maneuver areas picked up radio information from the participating units and relayed it to a larger station on Tiefort Mountain. From there the combined data flowed back to the CIS via coaxial cable (Chart 3). The CIS then processed and displayed the data as necessary for analysis, evaluation, and decisionmaking. Personnel in the Operations Center could control the exercises by transmitting messages to controllers in the field.[7]

The CIS interfaced with or controlled the other major subsystems and served to integrate data received from all sources. Two other major subsystems, a range data measurement subsystem and a range monitoring and control subsystem, gave the NTC the capability to compute player locations, record the simulated engagements, and monitor and control all training activities. Instrumentation at NTC consisted, during Phase I, of equipment already tested and in use by Army experimentation and testing agencies. The equipment also included the Multiple Integrated Laser Engagement System (MILES) devices for casualty assessment and voice and video recording subsystems.

At the beginning of an exercise, each player (dismounted infantry, tanks, armored personnel carriers, or weapons) was matched with an identification code. Any data concerning a player, such as weapons firing, movement, or change in status to "killed," was stored in this file. To control the

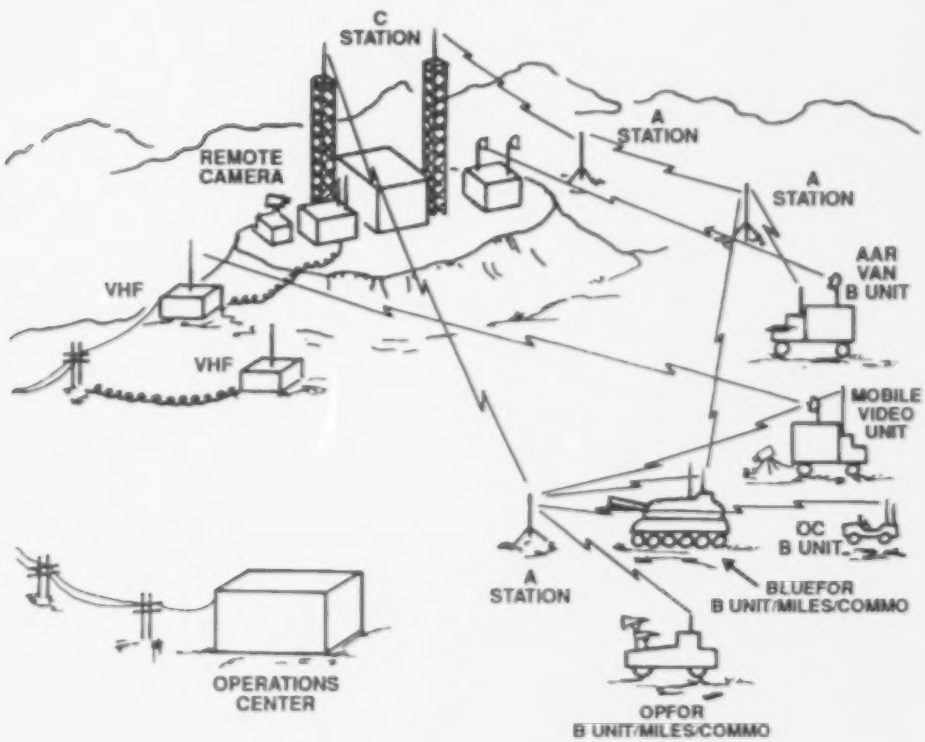
6 Ibid., p. IV-13.
7 Furman and Wampler, "Methodology," pp. 47-50. (2) Reischl, "Battalion Training at the NTC," p.50.

Table 7
NATIONAL TRAINING CENTER
PHASE I INSTRUMENTATION SYSTEM HIERARCHY



Source: Ford Aerospace and Communications Corporation, Engineering Services Division for the U.S. Army Missile Command. National Training Center Instrumented Training Demonstration (NTCIA) Final Report, 20 May 80.

Chart 3
NATIONAL TRAINING CENTER
INSTRUMENTATION SYSTEM



Source: **Science Applications, Inc. for Defense Advanced Research Projects Agency, A Briefing on Concept Design and Operation for the Core Instrumentation Subsystem at National Training Center, 29 Jun 83.**

84

aggregation of data by units, each player was assigned to a tactical unit, and a listing of identification codes for all members of a unit was stored in the CIS. If, during maneuvers, a player was cross-attached to another unit, all subsequent information concerning that player was credited to the new unit. The instrumentation was flexible enough to accommodate reorganization of entire units and could compute and update statistics every five minutes for a maximum of fifty units. All data items were numbers that could be manipulated, aggregated, or reformatted to evaluate performance in accordance with the measures of performance, or battlefield operating systems, as identified by CATRADA. The NTC instrumentation was programmed for expansion by phases with an attendant increase in the number and variety of statistics available for computation.[8]

The Range Data Measurement Subsystem, usually referred to as RDMS or RMS, included two major components: a position location subsystem and a weapons engagement subsystem. The RDMS was developed by General Dynamics Electronic Division (GD/E) as a subcontractor under AMEX Systems, Inc. for Phase I implementation. The position location subsystem was designed to provide a record of the location of enemy and friendly personnel and of combat vehicles and their associated weapons. Positions of players were to be determined by analyzing the time differences between range pulses generated at fixed stations and the return of the pulse from the player element via a receiver-transmitter device. In a process known as triangulation, a player could be located if three stations picked up its transmission (Chart 4). Each player's location was recorded in map coordinates every thirty seconds and the measured data filed by time sequence in the CIS computers. When the exact locations of players were known, movement distances and ranges between players could be computed more or less accurately.

At the end of Phase I, several problems remained to be solved with position location procedures. The fact that vehicles kept disappearing from view by going down in gullies or behind hills led senior observer-controller Col. Larry E. Word to term the position location system the "Achilles heel" of NTC instrumentation. The minute any one of three fixed stations could not pick up a signal, the vehicle's position was lost to the analysts in the Operations Center. In addition, most infantry weapons such as rifles, dismounted TOW missiles, and Dragon anti-tank missiles, were not equipped with position location units.[9]

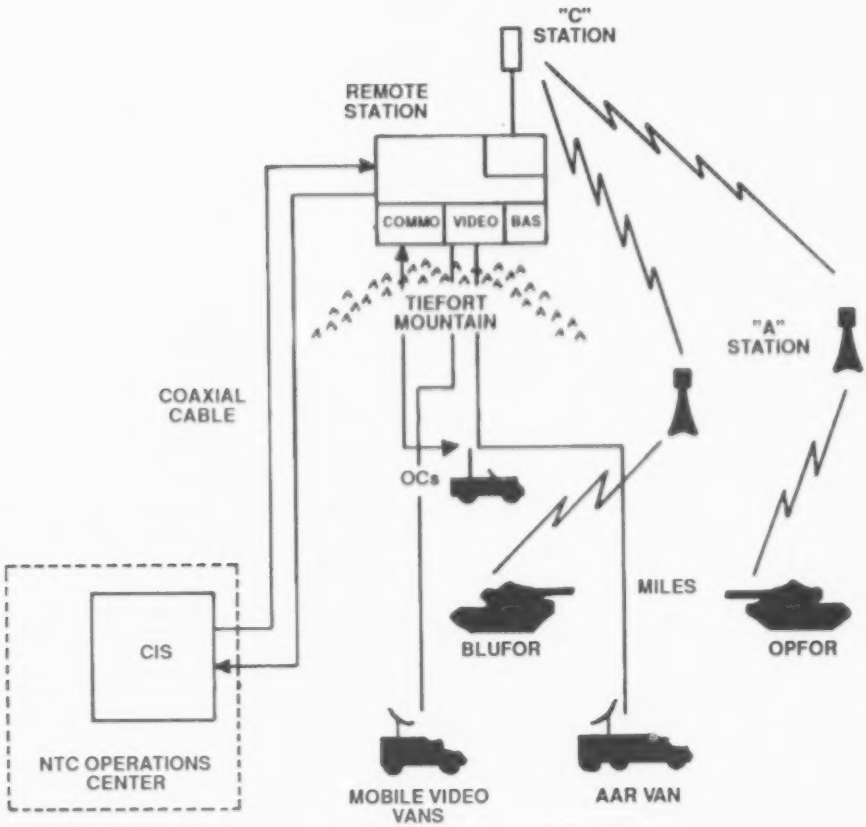
The weapons engagement subsystem complemented the operation of the position location system and was designed to keep a record of a vehicle's key firing events and the hits recorded on it. Every time an instrumented player fired a weapon, the time of firing, the weapon type, and the location of firing was automatically recorded and sent to the central data bank. If a simulated round impacted on or near a player, the time of impact, type of weapon, and the effect on the player (near miss, hit, or kill) was recorded. As the CIS recorded those events, the instrumentation was designed to pair both firer and target by time coincidence. Since player identifications were already stored in the CIS,

---

8 (1) Furman and Wampler, "Methodology," pp. 50-53. (2) Reischl, "Battalion Training at the NTC," pp. 43-60.

9 (1) Furman and Wampler, "Methodology," pp. 193-84. (2) Word, "Observations," p. 17. (3) Martin Goldsmith, "Applying the National Training Center Experience—Incidence of Ground-to-Ground Fratricide" (Rand Corporation for the U.S. Army, Feb 1966) pp. 3-5.

Chart 4
NATIONAL TRAINING CENTER
POSITION LOCATION SYSTEM



Source: William L. Shackelford, "NTC Perspectives," p. V-2.

theoretically exercise controllers could identify the type of weapon system firing and the target hit. From those recorded events the following data items could be compiled: distances between firers and targets; number of players remaining by weapon type; number of rounds of ammunition fired by each weapon type; and number of targets of various types hit or killed by both the OPFOR and the Blue Forces.[10]

The core instrumentation subsystem also received information from the other major subsystem, the Range Monitoring and Control Subsystem (RMCS). The development of that system remained under contract to AMEX Systems, Inc. The RMCS included a voice and video component, a spectrum analysis component, field controllers, and the live-fire system.[11]

Data from radio communications and film of the actual force-on-force engagement were provided at the NTC via the voice and video recording system. That system was capable of monitoring and recording more than twenty different radio networks. When an instrumented radio set transmitted a message, the beginning and ending time of transmission was automatically entered into the data bank. Evaluators could then compute the number and duration of transmissions by each radio set. In addition, selected radio nets were recorded for message content. That activity proved helpful in disclosing communication security violations and for evaluating operators for proper radio procedures. The instrumentation system did not, however, allow automatic synchronization of audio transmissions with the graphics displays. To provide a visual record of the training exercises, six video teams were assigned to various sectors of the battlefield. Film of actual locations and the surrounding terrain provided insight into field positions and reflected the use of available terrain features for concealment. Videotapes also gave overall views of dust and smoke conditions.[12]

The RMCS spectrum analyzer component detected and identified by equipment type, any unauthorized electronic emissions. That data when transmitted to the central computer facility provided the capability to analyze electromagnetic emission data and assist in the management of the frequency spectrum. Emission control was particularly important at the NTC to ensure that the training center's operations did not interfere with other electromagnetic spectrum users in the area, especially the Air Force's Goldstone deep space tracking station. It also protected non-training related post communications activities.[13]

The Multiple Integrated Laser Engagement System

The Multiple Integrated Laser Engagement System, or MILES, developed by Xerox Electro-Optical and fielded for infantry weapons in 1981, was one of several advances in tactical engagement

10 (1) Furman and Wampler, "Methodology," pp. 183-84. (2) Reischl, Battalion Training at NTC," pp. 43-44.

11 James W. O'Keefe and Karla Frandson, "U.S. Army NTC Advances Realism in Battalion-Level Training," *Defense Electronics*, June 1982, p. 53. James W. O'Keefe was the first NTC project control manager at AMEX Systems, Inc. When this article was written, Karla Frandson was manager of the NTC instrumentation program administration.

12 (1) Furman and Wampler "Methodology," pp. 52, 53, 185. (2) Reischl, "Battalion Training at the NTC," p. 60.

13 Furman and Wampler, "Methodology," pp. 52, 53, 105. (2) Reischl, 'Battalion Training at the NYC.," p. 60. (3) Shackelford, "NTC Perspectives," p. V-5.

simulation that made possible training like that envisioned for the NTC. Indeed it proved to be, along with command-and-control battle simulations, one of the twin technological foundations of the post-Vietnam training revolution.

Field training exercises and maneuvers, especially those involving multiple companies or battalions, had always lacked realism. The outcome of engagements between opposing forces had been measured by exercise controllers who "refereed" or "negotiated" the result based on massed firepower alone. The employment of that method of training evaluation often meant a low level of participation for many soldiers whose successful combat performance and marksmanship or gunnery skills went unnoticed and unrewarded. A number of improved systems were developed in the 1970s to remedy that situation, but all still proved unsatisfactory.

The new laser engagement system, which simulated the fire of direct fire weapons in engagement simulation exercises, consisted of a coded beam laser transmitter which was attached to the weapon whose fire it was simulating, and laser detectors attached at prominent places on the targeted soldier or vehicle. By the close of 1984 those devices were under development or already available for use on small arms, tanks, armored personnel carriers, the Bradley fighting vehicles, and antitank missiles such as TOWs and Dragons.

Developers also planned to instrument aviation elements at the NTC in order to portray the third dimension of the battlefield. In late November and early December 1983, testing of the Air Ground Simulation/Air Defense (AGES/AD) system for the AH-1 Cobra helicopter, the OH-58 Kiowa helicopter, and the Stinger air defense missile began at the NTC. The success of those tests led to a second demonstration in March 1984. By August the MILES training devices were also available for the Vulcan and Chaparral air defense systems and for the UH-1 Huey helicopter. However, as late as September 1964, position location equipment had been installed only on the AH-1. At that time none of the helicopters equipped with MILES were linked into the CIS. Safety releases required for its installation on the OH-58 and UH-1 were not yet available. A second phase of the program, which is beyond the scope of this study, was expected to provide the laser-based devices for the AH-64, OH-58D, UH-60, and CH-47 helicopters. At the end of Phase I development, no fixed-wing aircraft were instrumented. That subject is discussed at length in Chapter 8.

The lack of adequate MILES equipment for aircraft presented serious problems for the exercise controllers in the field. They were forced to find a way to assess airstrikes and take vehicles that would have been hit out of action, a difficult task at best. In addition, to assess the effects of airstrikes on maneuvers, controllers had to have expertise on the effectiveness of air power and experience in manually entering data into an otherwise automated control and display system.[14]

---

14 (1)Memos ATTG-ZX, Maj Gen Maurice O. Edmonds to CofS, 16 Nov; 7, 21 Dec 83; 3 Oct, 2 May 84, subj: DCST Significant Activities. (2) TRADOC Annual Historical Reviews, FY 1981, pp. 319- 21; FY 1982, pp. 297-98; FY 1983, pp. 161-65. (3) Bolger, *Dragons*, pp. 67-69. (4) SFC Charles R. Souza, "MILES Training Takes Wings," *Army Trainer*, Spring 1984, pp. 32-33. (4) MFR ATCG, Gen William R. Richardson, 7 Feb 84, subj: Visit to NTC. (5) Shackelford, "NTC Perspectives," p. VI-13. (6) For an account of a brigade level training exercise in which MILES was employed, see Col Wayne A. Downing, Lt Col James R. Riley, and Capt David M. Rodrequez, "Training for Maneuver Warfare," *Military Review*, Jan 84, pp. 16-27.

Despite its lagging application to aircraft, the MILES provided a method of teaching and testing battlefield tactics and strategy to a degree never before possible. It allowed objective judgments as to the survival of soldiers and units in tactical exercises. When a blank was fired by an M16 rifle, for example, a small microphone on the weapon picked up the sound and triggered the firing of a laser "bullet." To detect hits from a laser beam, each soldier wore a set of detectors mounted on a load-bearing harness and on his helmet. If the laser beam struck a detector on the target, the weapon scored a "near miss," a "hit," or a "kill." When a soldier was near-missed, his detector emitted an intermittent alarm, warning the soldier that he needed to take better cover. If he was "dead," the alarm sounded continuously. Microchips in the detector were programmed, according to probability tables, to decide when a soldier was dead and to disregard hits from weapons that could not logically damage the target (i.e., an M16 could not kill a tank). To turn off the alarm, a soldier had to remove a key from the laser transmitter and insert it into a control receptacle. With the key removed, the laser would not fire, and the soldier was out of action or "dead." Weapons could only be reactivated with keys reserved for the exercise controllers.[15]

When a tank main gun fired a simulated charge, a weapons signature simulator fired a visible and audible signal. A firing message was simultaneously sent through the tank's position location unit to the CIS. Should the laser beam hit a target vehicle, the target's instruments registered the weapon type scoring the hit and, in the case of targeted tanks, disabled the target's firing mechanism. Vehicles, with MILES detectors attached to exposed areas and vulnerable points, had a yellow dome light that spun once for a near miss and constantly for a hit. A beeping sound in the intercom system notified personnel inside a tank of their "death." Meanwhile, a "hit" signal was transmitted to the CIS. There the analysts attempted to match the firing message to the hit using type of fire and time. All too often, however, pairings could not be made because of lost signals or other instrumentation problems. When pairings could be determined, the instrumentation system displayed a firing vector between the vehicles; recorded near misses, hits, and kills; showed the locations of firer and target; calculated the range;and kept cumulative scores. For the antitank missiles, special MILES versions of the trackers or sights calculated the missile flight time.[16]

As designed for the AH-1 Cobra helicopter, the MILES AGES/AD laser transmitters duplicated the range and lethality of the helicopter's 20-mm. cannon, 2.75-inch rockets, and TOW missiles. The aircraft were also equipped with laser detectors making them vulnerable to laser fire from MILES-equipped ground based weapons. A strobe light augmented by a smoke grenade automatically activated if the aircraft was "killed." A high pitched tone on the intercom system alerted the crew that they were no longer in action. MILES AGES/AD exercises, like those for ground troops, were monitored by observer-controllers. The new battlefield simulation devices thus allowed for combined arms exercises using actual weapon controls and procedures.[17]

---

15 SSG Rico Johnson, "MILES," *Army Trainer*, Winter 81-82, pp. 26-28.

16 Robert A. Levine, James S. Hodges, and Martin Goldsmith, "Utilizing the Data from the Army's National Training Center: Analytical Plan" (Rand Corp for the U.S. Army, June 1986), pp. 4-5.

17 SFC Charles K. Souza, "MILES Training Takes Wings," *Army Trainer*, Spring 84, pp. 32-33.

Although the objectivity MILES provided was a vast improvement over the subjective judgment of umpires, the system had some disadvantages for rotating battalions. First, unlike the resident, experienced "enemy" OPFOR, many units that had been unable to train on MILES at home station had to learn the techniques of battery replacement, lens cleaning, and boresight calibration before beginning maneuvers. Second, while the MILES was an innovative and effective solution to direct fire simulation, it could not simulate the indirect fire of artillery and mortars. In addition, smoke on the battlefield often prevented the laser transmitters from penetrating to their target. Additionally, the boresight of the MILES device on some weapons would not hold for acceptable periods, thus causing inaccurate hit and miss data. Human attitudes on occasion also compromised the data MILES could provide, as soldiers caught up in the excitement of the battle cheated to remain in action.

Despite those few drawbacks—and the fact that the element of fear present in actual combat could not be simulated—the MILES allowed objective judgments as to the survival of each soldier and unit to be made immediately and with more accuracy than in the past. To prevent as much as possible the skewing of casualty statistics, it was NTC policy that no combat vehicle weapon system or soldier with an inoperative MILES device was allowed to participate in training within the task force area of influence. And, because "killed" players were prevented from participating further in the conflict, commanders and their troops felt the immediate results of their battle plans and orders. The MILES also provided much of the data necessary for the NTC's exercise controllers to assess a unit's proficiency and identify its weaknesses.[18]

Observer-Controllers

In addition to data from the instrumentation, the core instrumentation subsystem received information from field observer-controllers, always referred to at the NTC as "OCs." Those personnel were detailed to each unit down to platoon level for the purpose of recording each battalion's combat operations. The OCs could thus serve as the collection source for nonquantifiable data. They also were responsible for an on-site evaluation of a unit's performance in such areas as maneuver, target acquisition, fire support, command and control, and administration. Originally the NTC Operations Group included only two OC teams, each of approximately fifty persons, and commanded by a lieutenant colonel. However, late in 1982 TRADOC added another team to support an increase in the number of rotations per year and to prevent OC "burn-out." One OC team was dedicated to the training and performance assessment of the armor task force, another to the mechanized infantry task force, and the last to live-fire training of both task forces. Each rotating battalion had approximately thirty OCs assigned to it. The company and platoon OCs moved about the battlefield in tracked vehicles; all others were assigned light tactical half-ton vehicles.

While the observer-controllers acted primarily as trainers, they also assessed Blue Force casualties and provided battlefield effects in the form of pyrotechnics to simulate chemical and high

18 Shackelford, "NTC Perspectives," p. V-20.

explosive munitions employed by the OPFOR. As impartial trained observers, the OCs were in the best position to judge the application of doctrinal principles. Thus, in the assessment of unit proficiency and battle outcome, the OCs played an important role, if a statistically less reliable one than the instrumentation systems.[19]

Each noncommissioned officer and officer who served as an OC at the NTC was required to have had experience in the branch he would represent and at the job level he would perform there. For example, a mechanized infantry company OC would have already been a mechanized infantry company commander. Duty as an OC was demanding and required that those who served in that capacity never take actions compromising training. Col. Larry E. Word, who served as senior observer-controller for mechanized infantry battalions at the NTC for three years put it this way:

> *[We must] put ourselves at the critical point at the critical time. That becomes a little tougher in two-sided engagements because we have to do that without detracting from the tactical atmosphere of the exercise. If a squad is low-crawling up an objective, the last thing they need is a squad evaluator walking along in the middle of the squad. He is going to lose his credibility in a hurry. The first time he gives the squad away, something worse is probably going to happen than losing his credibility. We have to be at least one step more tactical than the soldiers we are with. If they are walking, we are stooping: if they are stooping then we are on our hands and knees: if they are on their hands and knees, we are on our belly. Any time a controller is seen out there, he is seen after somebody from the unit has been observed. That makes the job of observing a little tougher, but it is a golden rule. The number of observers we need can very well be a detractor if we are not careful.*

To further minimize the incidence of training detractors, the NTC cadre dressed the same as the exercise participants. Cameras and other instrumentation equipment were hidden. As far as possible, the NTC managers insisted that visitors had to "blend into" the training center environment.[20]

The role the OCs played at the NTC was not the one envisioned in the original concept. Initially NTC developers had planned that the training analysts, employing the instrumentation, would provide all of the training feedback required for the after action reviews. The OCs' responsibilities would be limited to providing battlefield effects, assisting in casualty assessment, and ensuring that MILES procedures were adhered to properly. That division of labor had to be abandoned. The OC teams were forced to provide analysis of training performance and conduct task force after action reviews because the instrumentation system was not operative when training began at the NTC. As the OC teams gained experience and expertise, it became evident to the NTC Operations Group that OC observations were a dominant factor in the analysis process. Despite its sophistication, the high

---

19 (1) Furman and Wampler, Methodology," pp. 186-87. (2) Shackelford, "NTC Perspectives," pp. IV-9 to IV-12.

20 (1) Col Larry E. Word, "Observations from Three Years at the National Training Center," Carol A. Johnson,ed (U.S. Army Research Institute, Presidio of Monterey Field Unit, Sep. 1986), p. 33 (quotation). Col Word left the NTC in 1986 to become Director of the Joint Readiness Training Center at Fort Chaffee, Ark. (2) Shackelford, "NTC Observations," p. II-4.

technology of the instrumentation could not simulate the sight and hearing of the OC. As one senior NTC official remarked:

> *The OC's, living in the field with the units, gained intimacy in the unit procedures, personalities, and characteristics that the instrumentation system could not penetrate. . . the melding of the power of the instrumentation system, orchestrated by TAF analysts, and the battlefield observation of the OCs give a depth of understanding as to unit performance not exercised anywhere in the world except at NTC.*[21]

Admiration for the OCs and for their contribution to training evaluation at the NTC was not, however, universal. In August 1984, the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) in conjunction with the Center for Army Leadership (CAL) began a research project to assess the quality of leadership training for OCs and the effectiveness of their data collection methods. The purpose of the study was to determine how the quality and quantity of the data the OCs provided at Fort Irwin could be improved and the leadership qualities of OCs better developed. In the fall of 1984, a two man team from ARI and CAL joined the OCs for a two-week rotation. In a report delivered a year later to the Military Testing Association, the ARI researcher concluded that "the observer/controllers receive little or no training" and that there was "considerable variation between OCs on decision rules guiding observations and feedback." Because no standard means existed of making notes of their observations, little of the information they gathered was permanently recorded. Their conclusions must have caused deep concern for the training analysts, although Col. Shackelford maintained that as a result of ". . . the use of strict measures of performance the observer controllers are the most expert and experienced combat officers and non-commissioned officers found anywhere in the Army."[22]

The Live-fire Range

Units rotating to the NTC would at some time during their stay train on a battalion-size live-fire range. As developed by TRADOC, the NTC live-fire concept included the control and presentation of realistic target arrays to be engaged by maneuvering units, and the instrumented recording of event data to assist in the evaluation of a unit's proficiency. On 1 June 1977, TRADOC headquarters had told the TRADOC Combined Arms Test Activity (TCATA) at Fort Hood to prepare plans to test the technical and operational feasibility of such a range, and to select and procure an off-the-shelf remote controlled target system for the NTC. In coordination with CATRADA and the U.S. Army Intelligence Center and School, TCATA developed a target array to portray a Soviet motorized rifle regiment. The target array contained 195 targets representing vehicles and 61 representing personnel.

---

21 Shackelford, "NTC Perspectives," p. V-21.

22 (1) Earl C. Pence, "Leader Performance Criteria at the National Training Center (NTC)" in James H. Banks and Patrick J. Whitmarsh, eds. "An Overview of ARI's Research Program on the National Training Center: Symposium Proceedings," ARI Research Report 1447, pp. 12-17, quotations from p. 13. (2) Shackelford, "Observations," quotation on p. IV-12.

Meanwhile, the Combat Developments Experimentation Command was assessing the feasibility of employing laser hit detectors on the remote control targets. In January 1979, 2d Armored Division units at Fort Hood participated in the validation of the instrumented live-fire range.[23]

In the Fort Hood tests, six armor heavy company teams acting as player units were "attacked" by full-sized, pop-up, vehicle silhouettes. The targets were distributed among seven parallel belts and ranged from 380 to 4,000 meters in front of a battle position. They could be raised and lowered by remote control in such a manner as to create the illusion of a Soviet force closing at 12 kilometers per hour. The battle was simulated six times, using a different defensive unit each time. Sensors recorded hits and near misses, and telemetered the results to a central data bank for display and critique. When necessary, modifications were made to the system to ensure that realism was maximized. From test results, TCATA concluded that such a live-fire range was operationally and technically feasible, and that a laser hit detection system was compatible with the system as tested. The live-fire range also provided a challenge to the firepower and command and control requirements of armor and mechanized infantry commanders conducting defensive operations. In August 1980, the TCATA advance party began preparation for construction of a battalion-sized live-fire range at the NTC, and Fort Irwin received its first delivery of automated targets.[24]

The live-fire range as constructed at Fort Irwin measured 68 kilometers by 25 kilometers and was composed of 500 full-sized plyboard silhouettes of armored fighting vehicles and dismounted infantry personnel. Plans were to increase the array to 1,000 targets, but funding constraints in FY 1983 forced temporary suspension of the procurement of additional targets. To enhance the realism of training exercises, the range also included fire effects devices such as smoke generators and flash simulators. The entire system was battery powered and remotely controlled by radio signals. Exercise controllers working from concealed positions could command the targets to "pop-up" in a time sequence thus creating the illusion of an opposing force approaching or retreating at a variable rate. Because the targets were portable, controllers could design different configurations to portray different opposing force units and missions. As in the Fort Hood tests, the targets were arrayed in seven "belts" placed at various distances from the firing position and exposed in a manner consistent with the attack speed of a Soviet motorized rifle regiment. To account for OPFOR casualties, fewer targets were presented in succeeding belts. To record and assess casualties, both armor and personnel targets were fitted with ballistic sensors to record "hits" from projectile weapons and laser sensors to detect hits from weapons like the TOW and Dragon missiles that were equipped with the MILES.

---

23 TRADOC Combined Arms Test Activity (TCATA) Final Report FT 398, National Training Center Phase I Concept Evaluation for Instrumented Live Fire, June 1979, pp. 1-1 to 1-3.

24 (1)Ibid. (2) Maj Randolph W. House, "NTC Live Fire: One Step Closer to Battlefield Reality," *Military Review*, Mar 1980, pp. 68-72. (3) TRADOC Combined Arms Test Activity (TCATA), Training Developments Test Directorate. National Training Center Live Fire Exercise Development Plan [August 1980].

Each target also had a red smoke "scorer" which automatically fired when a target was hit. The automatic scoring mechanism had built-in minimum kill thresholds, so that kills from various weapons could be realistically recorded—as in the force-on-force maneuvers. An M16 rifle could not kill a tank. When a target was killed, black smoke was activated.[25]

Target hit data were forwarded to the range control system via a transmitter on each target. That information was then stored in a minicomputer which also relayed it to the CIS for integration with other data needed for evaluation of unit performance. The actions of the training unit were transmitted to the data center through the MILES or, for ballistic weapons, an interface box which was keyed by the firing of the vehicle's weapons. The reporting system recorded weapon-type fired and ammunition used. At the CIS a full picture of mission results was obtained by correlation of the target hit data and the firing data through time coincidence (Chart 5).[26]

The live-fire range concept, as TCATA had designed it, had several shortcomings that remained to be solved at the end of NTC Phase I implementation. The most apparent problem was the inability of the system to detect either the type or identity of the killing weapon. Nor could it indicate the intended target. Likewise, there was no means of assessing casualties incurred by the training units. That deficit undoubtedly affected engagement results in their favor, since a uniform amount of firepower could be employed throughout the exercise. It also meant that the unit commander was never placed in a casualty situation. On the other hand, to declare some players "killed" resulted in the loss of training time. Another unresolved issue was the problem of employing indirect fire. The NTC concept called for the use of live artillery against targets. That action, however, resulted in target "kills" from concussion effects or flying shell fragments which would not have disabled actual combat vehicles. In addition, the impact of explosive rounds damaged the targets. The targets could be shielded from these artillery effects in 600 pound steel containers, but they would then lose their portability.[27]

The Indirect Fire Problem

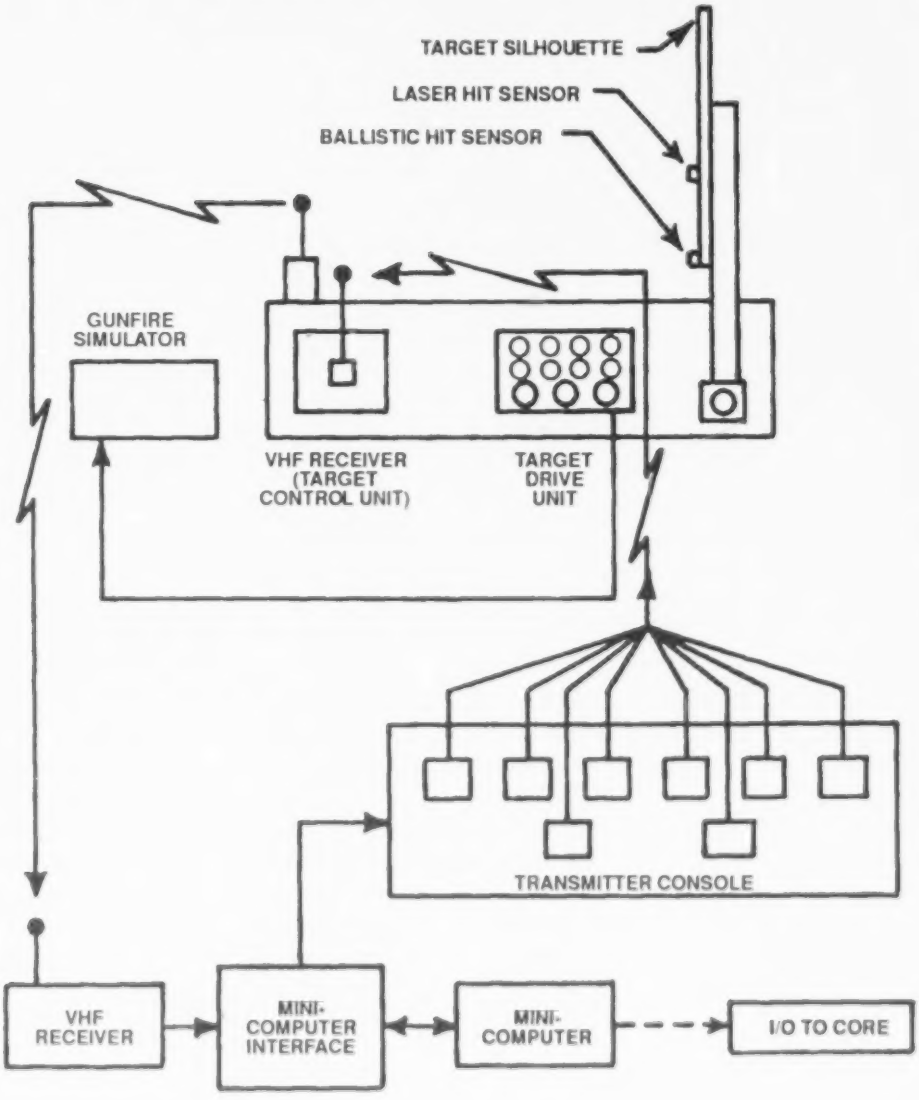
The inability to adequately simulate indirect fire affected more than just the targets on the live-fire range, and a solution continued to elude project managers and contractors alike during the entire NTC Phase I development process. NTC developers had envisioned a facility where all the elements of combined arms warfare would come together to provide the most realistic battlefield environment

25 (1) TCATA, Live Fire Exercise Development Plan pp. 1-4 and Appendix A. (2) Army Science Board Ad Hoc Sub-Group Report on the National Training Center, Mar 1981, p. A-4. (3) Reischl, "Battalion Training at the NTC," pp. 51-55. (4) Semiannual Historical Reports, ODCST, Oct 82 - Mar 83, pp. 45-46' Apr - Sep 83, p. 18. (5) Ltr ATTG-OHR, TRADOC to distr, 31 Jan 83, subj: Office of the Deputy Chief of Staff for Training Newsletter 81-3.

26 Reischl, "Battalion Training at the NTC," pp. 54-55. (2) TCATA, Instrumented Live Fire Report, Jun 1979, pp. 1-11, A-1 to A-4, and 2-43.

27 Reischl, "Battalion Training at the NTC," pp. 55-56.

Chart 5
NATIONAL TRAINING CENTER
LIVE FIRE SYSTEM RANGE CONTROL UNIT



Source: Timothy J. Reischl, "An Examination of Batalion Training at the National Training Center," (M.S., Naval Postgraduate School, 1980).

possible. The NTC concept dictated that artillery and mortar fire be present, either in the form of live-fire or by simulation. Live artillery fire in engagement simulation presented not only an unacceptable safety risk but was also much too costly. For years the Army had struggled with the problem of simulating indirect fire in training exercises. Developers and researchers believed the simulation concept to be valid, but it had proven to be technologically difficult and frustrating to execute. As early as 1974, researchers at CDEC complained that "scoring the effects of artillery and mortar bursts defied all attempts to conceptualize applicable instrumentation. . . ." During Phase I development of the NTC, an ad hoc study group of the Army Science Board concluded that "there appears to be no satisfactory method for simulation (or scoring) indirect fire and handling this in the play. . . ."[28]

Efforts at the NTC to solve this major weakness in the representation of weapons effects pointed to some of the main problems. The system designed for assessment of indirect fire casualties employed both the instrumentation system and field observer-controllers. When a unit requested artillery or mortar fire, usually through their fire support teams, the call passed up the fire support system to the artillery battalion fire direction center, and from there to the designated firing battery for target attack, and to the artillery analysis team in the central Operations Center. There, the firing data—time, location of desired impact, number, and type of rounds to be fired—was entered into the CIS computers. When the mission was fired, the OCs marked the fire using pyrotechnic simulators and checked the impact area for the presence of forces. Since exercise controllers knew firing battery positions (through the position location system), the computer could simulate a projectile flight path and groundburst position. The computer was also programmed to allow for time delay between firing and impact, and could determine the size of the impact area according to the weapon fired. Casualties could then be assessed against instrumented players in the bursting radius according to predetermined kill probability tables for artillery weapons. The "killer" was then matched with the target by time of occurrence. This information was relayed to the OC who used his own judgment to determine if, in fact, predicted casualties had occurred. He then provided the CIS with actual combat casualties and deactivated the MILES equipment, thereby putting the affected players out of action.[29]

While this system did account for some of the effects of artillery fire, it could not realistically portray the effects of artillery upon troops in terms of the sights and sounds of a real battlefield. In addition, a time delay ensued until a controller had "killed" a player, who remained alive in the interim and capable of firing weapons. Kill probabilities were fixed and could not, therefore, reflect such factors as range, location of hit, or multiple hits. Perhaps most important of all, casualty

---

28 (1) John L. Romjue, *Development of Instrumentation Technology for Military Field Experimentation, U.S. Army Combat Developments Experimentation Command, 1956-1973*, Jun 1974, 1st quotation, p. 123. (2) Army Science Board Report, Mar 81, 2d quotation, p. 10.

29 (1) TCATA, Instrumented Live Fire Report, Jun 1979, pp. 2-6. (2) Reischl, "Battalion Training at the NTC," pp. 58-59. (3) Ford Aerospace & Communications Corporation, NTC1A Final Report, 20 May 80, p. 4-14. (4) Furman and Wampler, "Methodology," pp. 186-87.

assessment rested ultimately on the subjective evaluation of the OC. In addition to battlefield realism and data gathering, a primary goal of NTC planners and developers had been to eliminate the human factor, and thereby subjectivity, in the evaluation of training.[30]

Efforts at Department of the Army level and at TRADOC headquarters to deal with the indirect fire problem revealed some of the difficulties, as well as a general lack of agreement within the Army as to the direction such research should go. On 29 August 1983, Assistant Secretary of the Army (Research, Development, and Acquisition), Jay R. Sculley, wrote to General Richardson to express his concern and that of Secretary of the Army John O. March, Jr. with "the inadequacy of field artillery simulations in training." He continued: "As a first step, we feel that the field artillery simulations at the National Training Center, Ft. Irwin, should be upgraded to enhance as quickly as possible the battlefield environment for force-on-force training exercises." In Sculley's view, the most promising development along that line was the Simulation of Area Weapons Effects, or SAWE, the plans for which had been the result of the efforts of a joint study group composed of representatives of the Field Artillery School, the TRADOC Systems Manager for NTC, the AMC Program Manager for Training Devices, and the Jet Propulsion Laboratory. The SAWE device, tested at Fort Hood in 1983, could produce safe air bursts by employing pneumatic propulsion to launch styrofoam projectiles out to ranges of 500 meters. The projectiles were designed to burst at 20 meters in the air. Casualties were to be assessed based on the strength of an acoustical signal received by the MILES detection devices worn by soldiers on the ground.[31]

After studying the situation for some time, Richardson replied to Sculley expressing his own concern at the "considerable technical challenge" that the simulation of indirect fire continued to pose. The major problem was that of devising a system that would be interactive with the MILES and also exercise the artillery system. He suggested that any solution should solve the same problem for training throughout the Army, not just at the NTC. For that reason he recommended the Army not consider adopting a low-cost device being developed by Loral which would be usable only at the NTC. Richardson believed the SAWE system would best meet the Army's needs for better training simulation for indirect fire. On the other hand, Brig. Gen. Cole, the NTC commander, questioned the operational feasibility of the SAWE system and the NTC's ability to fund it. He and other NTC officials were especially concerned about how the system would be handled on the M548 tracked cargo carrier which also served as the chassis for the SLUFAE (surface-launched unit fuel-air explosive) launcher, an unguided rocket system designed to disarm enemy minefields with blast overpressure.

---

30 (1) Ford Aerospace & Communications Corporation, NTC1A Final Report, 20 May 80, pp. 4-14. (2) Army Science Board Ad Hoc Sub-Group Report on the National Training Center, Mar 1981, p. 10.

31 (1) Ltr, J.R. Sculley, ASA (RD&A) to General William R. Richardson, Cdr TRADOC, 29 Aug 83, Richardson Papers, TRADOC Office of the Command Historian, Fort Monroe, Va. (2) During this same period, the Jet Propulsion Laboratory began development of a system to simulate nuclear, biological, and chemical (NBC) warfare. That effort, known as SAWE-NBC, was not expected to reach fruition until at least FY 1990. TRADOC Annual Historical Review, 1 Oct 83 - 31 Dec 86, pp. 27-28.

Unlike Richardson, the NTC officials preferred a Xerox developed MILES system with a laser signal which would solve the simulation of indirect fire problem only for the NTC. In November 1984, Richardson visited the NTC and once again heard the center's top officials express concern about the SAWE system's shortcomings for use at Fort Irwin. As a result, he requested that the TRADOC Deputy Chief of Staff for Training look into a "NTC unique" system with an eye to resolving the differences of opinion that existed as to the best way to simulate indirect fire.[32]

As NTC development reached the end of Phase I late in 1984, the Army's continuing efforts to improve the evaluation of artillery and mortar elements taking part in tactical engagement simulation had yet to bear fruit. Similarly, in the assessment of training effectiveness, the human element continued to play a major role. However, the off-the-shelf instrumentation was fully in place, and training evaluation was beginning to benefit significantly from advancing technology. As the NTC moved into the second half of the decade, developers continued to seek means of getting the best possible return from the huge investment the NTC represented. In essence that meant a better means of objectively measuring the performance of maneuver battalion task forces in all dimensions of the battlefield.

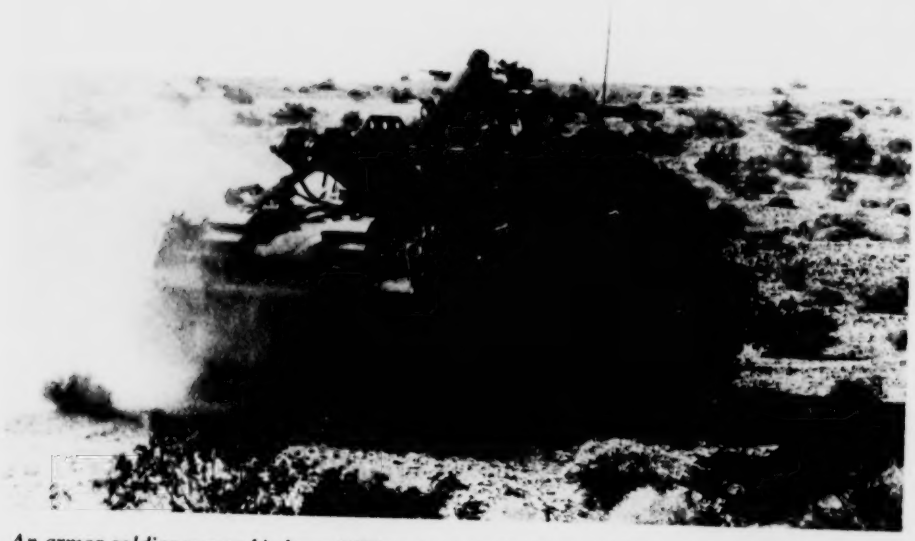
32 (1) Ltr, General Richardson, Cdr TRADOC, to the Honorable Jay R. Sculley, ASA (RD&A), 12 Dec 83. (2) MFRs, General Richardson, 7 Feb 84, subj: Visit to the National Training Center; 9 Nov 84, subj: Visit to the West Coast. Both in Richardson Papers, TRADOC Office of the Command Historian, Fort Monroe, Va.

U.S. Army tanks move up the Valley of Death as their tank transporters prepare to move to the rear. In the foreground, observer-controllers from the Operations Group prepare to follow the battalion task force to observe mock combat with the OPFOR.

A tanker drives his M60A3 tank out of a depression in the desert. Such depressions were used to mask armored vehicles from enemy observation and direct fires.

BEST COPY AVAILABLE

A U.S. Army OH-58A Kiowa scout helicopter looks for the enemy in the rocky and mountainous terrain.



An armor soldier moves his huge M88 recovery vehicle into a battle position. The M88 crew recovered damaged or immobile tanks, APCs, and self-propelled howitzers.

An M113A1 armored personnel carrier moves to the attack. The MILES sensor belts are attached to the side, and a kill indicator light is mounted on the right of the vehicle.

A U.S. Army Mechanized Infantry Company Team, with M60A1 tanks in the lead and M113 armored personnel carriers following, move to contact with the OPFOR.

BEST COPY AVAILABLE

The midday summer heat at Fort Irwin could reach as high as 115 degrees Fahrenheit. Water was a critical need—up to five gallons a day per soldier.

Armor soldiers camouflage an M60A1 tank to help conceal it from OPFOR observation. The shadows cast by the net will also offer limited relief from the intense desert sun.

BEST COPY AVAILABLE

Disarmed and blindfolded, an OPFOR sergeant becomes a prisoner of war. Note MILES sensors mounted on the U.S. Army soldier's helmet and web harness to record hits. The OPFOR soldier wears the black beret with star.

Prisoner interrogation was part of the mock battle.

Boxes of supplies provide a make-shift field desk for a soldier working on unit records. The tent in the background is a battalion support area supply facility.

Painted Rocks, just outside Fort Irwin's main gate, are covered with unit insignia memorializing the visit of rotating battalions.

BEST COPY AVAILABLE

Chapter VI

THE NTC EXPERIENCE

I personally believe . . . that the soldiers . . . individually and collectively, learned more at Fort Irwin than they might have learned in two weeks at war. And all emerged alive. Those . . . [soldiers] may no longer serve together, but infantry and armored units in which they will train or fight in years to come will profit from what they learned. The NTC breeds battlewise soldiers bloodlessly.

That says it all.

—General Paul F. Gorman[1]

Preparation and Deployment

The NTC scenario for each battalion began six to nine months before it deployed, with notification from FORSCOM of its designation for training. Six months before the training period, an NTC briefing group made up of members of the NTC staff and the TRADOC Operations Group visited the scheduled units in garrison to conduct the essential pre-training coordination. Members of the briefing team also sought to assure each unit that the NTC was a partner in the training process rather than an adversary. The briefing visits were scheduled so that two paired battalions could be briefed by members of their counterpart OC teams. The OCs explained the rules of engagement, offered lessons learned during other rotations, and answered questions. The group then conferred with division, brigade, and task force commanders to select from twenty-one tactical missions those that best suited the needs of the unit. Missions to be performed at the NTC were drawn from Army doctrine as set forth in FM 71-1, *The Tank and Mechanized Infantry Company Team;* FM 71-2, *The*

1 Quotation was taken from General Gorman's foreword to Bolger, *Dragons* p. viii.

Tank and Mechanized Infantry Battalion Task Force; and FM 71-100, *Armored and Mechanized Division Operations.*[2]

Having chosen the missions that would guide their training during the twenty-day rotation, troops began to train at home station for their visit to the NTC. For most units this proved more difficult than anticipated. None, after all, had access to the vast maneuver space of Fort Irwin. How could Fort Stewart, in swampy, thickly wooded southeast Georgia or Fort Carson in the forests of Colorado recreate the rocky, jagged ridges, and track ruts of the high desert of Southern California? Units had to do with whatever training facilities they had or simulate what they did not have. Meanwhile, the brigade, battalion, and company commanders of most units made advance visits to Fort Irwin to conduct terrain walks, meet the exercise controllers, and be briefed on NTC rules.[3]

In preparation for each unit's rotation, the TRADOC Operations Group developed the operations plans and training scenarios for each battalion task force. Scenarios were based on the training objectives of each unit's commander and required the approval of the Chief of the Operations Group and the NTC commander. Most scenarios featured an invasion of a United States ally known as "Mojave" by a Warsaw Pact nation known as "Krasnovia." The six basic engagement scenarios were movement to contact, hasty attack, deliberate attack, defend in sector, defend from a battle position, and meeting engagement. While the completed scenarios dictated the force ratios of the combatants, they did not reflect schemes of maneuver for the Blue Forces. The OPFOR, therefore, were not forewarned of their opponent's tactical plans. Scenarios were never the same for any two task forces. Furthermore, care was taken that no task force ever maneuvered on exactly the same terrain twice or repeated a scenario. In addition to the scenario, every operations package contained operations plans for the task force's controlling brigade, orders, astronomical data, graphic overlay maps, instructions to the OPFOR, event lists and schedules, close air support schedules, and ammunition allocations. Approximately a month before its arrival at the NTC, the brigade received the operations plan for the simulated conflict. To create a realistic environment, units received intelligence reports on the OPFOR leading up to their actual deployment to the NTC.[4]

At the time of deployment, battalions and their support elements (engineers, signal, artillery, logistics, etc.) which came from a distance—and most did—flew by military or commercially

---

2 (1) NTC Development Plan, Appendix 1, pp. 1-1 to 1-3. (2) Reischl, "Battalion Training at the NTC," pp. 20-30. (3) Semiannual Historical Report, ODCST, Apr - Sep 83, p. 46. (4) Shackelford, "NTC Perspectives," pp. VI-3 to VI-4.

3 Shackelford, "NTC Perspectives," p. VI-7.

4 Shackelford, "NTC Perspectives," pp. VI-4 to VI-7. Patrick J.Whitmarsh, "Types and Quality of NTC Data" in An Overview of ARI's Research Program on the National Training Center Symposium Proceedings (ARI, Aug 1987), pp. 7-11. The Unit Training Directorate of the Command and General Staff College initially required that scenarios be approved by the CGSC. However, when delays in approval adversely affected training, that approval step was eliminated.

chartered aircraft to air bases near Fort Irwin (usually Norton Air Force Base, California). Buses then transported the troops to the training center. Arriving troops established pup-tent cities in an area near the motor pool known as the "Dust Bowl" and set up command posts in nearby boxcars. Base Operations (BASOPS) at Fort Irwin were designed to fully support only the post and permanent party personnel. In accordance with the NTC operational concept, BASOPS provided only "austere support to rotating units." Units spent the first three days at the NTC drawing food and ammunition, off-loading equipment and support vehicles shipped by rail from home station, and drawing instrumented combat vehicles from the NTC inventory.[5]

The NTC development plan had called for units to use equipment prepositioned at Fort Irwin. On 1 October 1981, Boeing Services International, under contract to the Army, began administering the issuing and maintenance of combat vehicles at the Fort Irwin motor pool. This arrangement supposedly had two major advantages: first, it was meant to save money; second, the drawing of prepositioned equipment was in line with procedures for deployment to Europe. However, as some NTC planners had feared, the abuse the vehicles and tanks were subjected to on the rugged terrain defeated the purpose of saving money and forced units to fight with inferior equipment. The drawing of equipment from the Boeing yard quickly became a major problem which centered around the contractor's inability to maintain it and properly prepare it for issue. The NTC also suffered at the hands of higher priority claimants for the Army's limited inventory of vehicles. In addition, the prepositioning concept was significantly complicated by force modernization. Troops were increasingly forced to train at Fort Irwin with weapons and equipment they had not become familiar with during home station training.[6]

As the equipment problem continued to plague the NTC, units were required more and more to bring vehicles from their home stations to offset issue shortfalls. Finally, on 22 July 1983, the FORSCOM commander, General Richard E. Cavazos, directed that beginning on 1 October 1983, units would bring all noninstrumented tracked and all wheeled vehicles from their home station. In other words, only instrumented vehicles would be prepositioned at Fort Irwin. In defense of his action, Cavazos explained to General Wickham, Chief of Staff of the Army, that he was trying to hold down the overall cost of the NTC since it was bound to get tough congressional scrutiny in tight budget years. Although Cavazos's directive severely hampered training for mobilization dependent on prepositioned equipment, some Army officials argued that the possibility was very real that equipment prepositioned in Europe would be damaged before troops could reach it anyway. To

---

5 (1) Sp 5 Peter Strescino, "Swapping Swamp for Desert," *Soldiers*, Feb 1984, p 29. (2) Shackelford, "NTC Perspectives," p. VI-4. In addition to the two heavy battalions, a division sent a brigade "slice" including the brigade headquarters, a forward support battalion, a field artillery battalion, and divisional support engineers, signal, chemical, military police, air defense, and aviation assets.

6 (1) Bolger, *Dragons*, pp. 80-82. (2) FORSCOM Annual Historical Review, FY 1983, p. 205 (SECRET—Information used is UNCLASSIFIED) (3) Information Booklet, TRADOC Commanders' Conference, 26-29 Nov 84.

provide more instrumented vehicles, the Army planned to contract with General Dynamics Electronics in early 1985 for the development of instrumentation kits that could be quickly installed on nonresident vehicles. Meanwhile, in large part because of the increased cost of shipping equipment from home station to the center, plans for the twenty-one rotations (forty-two battalions) in FY 1984 were amended to include only twelve rotations (twenty-four battalions) that year.[7]

The Training Program

During their stay at the NTC, each battalion had the opportunity to take part in both force-on-force and live-fire exercises. On the fourth day at Fort Irwin, the two battalion task forces deployed to the field to begin simulated combat operations against opposing forces. Those exercises were conducted in the areas of Fort Irwin known as the "central and southern corridors". On day eight, one task force was released from control of its parent brigade to participate in live-fire training which was conducted in the NTC's northern corridor. On the twelfth day, that battalion returned to force-on-force training for six additional days. Meanwhile the other task force spent nine consecutive days at maneuvers followed by five days of live-fire exercises. Each exercise mission began with a briefing and the issuing of orders by the battalion operations officer. Each fourteen-day training period was broken into six to ten mission periods, with break periods between to allow for preparation, maintenance, and mission critiques. The last three days at the NTC were reserved for turning in equipment and preparing the unit for movement back to home station. Meanwhile NTC permanent party personnel prepared for two more battalions to arrive on the heels of those redeploying. With eight to twelve scheduled rotations involving sixteen to twenty-four battalions each year, little time was available between rotations for recovery and preparation for the next training period.[8]

The training that soldiers received at the training center was far different from traditional peacetime Army maneuvers that had depended on arbitrary rules of engagement and umpires to determine the outcome of wargamed "battles." Vehicle losses and troop casualties in the past had been assessed according to probability tables that assigned modifiers to such elements as weather, the use of artillery, and tactical deployment. The effects of air attacks and nuclear, biological, and chemical warfare had been simulated by delays in movement and force attrition. According to one company commander, "it is like a badly managed game of cops and robbers, complete with violent arguments over who shot whom." NTC planners took advantage of the available technology to counter the lack of realism. Use of the laser-based MILES, described above, allowed the recording of "kills," "hits," and "near misses" from direct fire to be automatically detected rather than called by referees. With the exception of the data gathered by the field OCs, all activity was, at least

7 Files, TRADOC Office of the Command Historian.

8 (1) Bolger, *Dragons*, p. 83. (2) Shackelford, "NTC Perspectives," p. VI-4. For a complete list of the training missions provided at the NTC see Furman and Wampler, "Methodology," Appendix A, pp. 168-69.

theoretically, monitored and recorded by the instrumentation system. All those efforts sought to make the evaluation of training as objective as technology would allow.[9]

The Opposing Force (OPFOR)

When the task forces with their OCs moved to the field, the opposing forces (OPFOR) they met were not simulated, but very real. The concept of employing units trained in the doctrine and tactics of the potential enemy was not new in Army history. In 1967, FM 105-5, *Maneuver Control*, established "aggressor" forces with no designated nationality. Those troops supposedly spoke Esperanto and used strange weapons known as INTERA tanks and Ripsnorter anti-tank missiles. Although the intelligence community provided information on aggressor tactics, aggressor troops fought like Americans in strange clothing and were almost always outnumbered and defeated by American forces. As one student of the OPFOR put it, "it smacked a lot of cowboys and Indians, with very stupid, indolent Indians." That method of portraying the enemy died in 1976 with the publication of FM 100-5, *Operations*, which spelled out the enemy as "highly mechanized forces typical of Warsaw Pact or Soviet surrogates" which would be employed in superior quantitative force ratios against U.S. forces. During that period, information on Soviet equipment, tactics, organization, and doctrine began to flow to the field, and the reconstructed agressor armies of the Warsaw Pact began to be designated OPFOR. The Department of the Army published objectives and goals for an "Opposing Force (OPFOR) Program" in Army Regulation 350-2 dated 28 October 1976.[10]

The Army's modern OPFOR program was directly influenced by the experience of the U.S. Navy and Air Force, discussed in Chapter 2. As a result of the success of the Top Gun and Red Flag programs which included force-on-force combat, NTC planners had included an OPFOR in the NTC concept from the beginning. The OPFOR units that began operations at the NTC early in 1982, were not unique in the Army during the 1980s, but it was at Fort Irwin that they were employed most extensively and effectively. As one observer put it, "If war is hell, the United States Army hopes the mock battles at its National Training Center . . . approximate purgatory." The NTC's opposing

9 Bolger, *Dragons*, pp. 66-67, quotation is on p. 67.

10 (1) Bolger, *Dragons*, pp. 16-17, quotation on p. 17. (2) FM 100-5, *Operations*, 1976, quotation on p. 1-1. (3) Edwards, NTC Development Plan, p. I-3. (4) A FORSCOM supplement to AR 350-2 of October 1979 established the OPFOR Training Detachment (Red Thrust) as the center of OPFOR information and expertise within FORSCOM.

forces—the 6th Battalion, 31st Infantry (Mechanized) and the 1st Battalion, 73d Armor—were meticulously schooled in Warsaw Pact doctrine and tactics and organized as a Soviet motorized rifle regiment (MRR) called the 32d Guards. That designation reflected the fact that in the Soviet Army, guards were elite units. And just as the American battalion task force was the lowest combined arms echelon, the MRR held the same position in Soviet force structure. To provide as realistic an environment as possible, OPFOR forces were numerically superior to the Blue Forces. In all, the 32d Guards numbered approximately 1,000. Permanent party OPFOR were often augmented by dismounted troops from Marine Corps infantry units or from other active and reserve component FORSCOM units.[11]

Opposing Forces vehicles were Vietnam-era M551 Sheridan armored reconnaissance vehicles that were visually modified (VISMOD) to look like Soviet T-72 main battle tanks, BMP armored infantry fighting vehicles, SAU-122-mm. self-propelled artillery, and the ZSU-23-4 four-barrel air defense vehicle. In FY 1980, the Army delivered 330 Sheridans from prepositioned and war reserve stocks in Europe to Anniston Army Depot, Ala. for inspection, repair, and limited modification with fiberglass, wood, or plastic VISMOD kits. The armored vehicles were painted light green in the Soviet style. The program to transform the vehicles was the responsibility of the U.S. Army Materiel Development and Readiness Command (DARCOM) and was originally funded at $17.7 million. When the work was completed, 230 of the OPFOR fleet of vehicles became permanent Fort Irwin assets. The remaining 100 remained at Anniston in reserve. Meanwhile, the Xerox Corporation made design changes in the MILES equipment to allow its use on the threat vehicles. Army-model Dodge pickup trucks were altered to represent the Soviet BRDM, a wheeled, lightly armored reconnaissance vehicle. The OPFOR also employed some real Soviet MTLBs, lightly armored, tracked personnel carriers, captured by Israeli forces in the Middle East conflicts. OPFOR couriers and scouts used

11 (1) Bolger, *Dragons*, p. 28. (2) SFC Michael Brown, "Learning the Hard Way," *Soldiers*, Feb 1984, pp. 14-19. (3) Semiannual Historical Report, ODCST, Apr - Sep 84, p. 140. (4) Staff Sgt Ann Keays, "National Training Center," *Army Trainer*, Winter 1981-82, p. 6 (hereafter cited as Keays, "National Training Center"). (5) MFR ATCG, Gen William R. Richardson, subj: Visit to the NTC, 7 Feb 84. (5) Jim Robbins, *New York Times Magazine*, 17 Apr 89, pp.38-42. (6) A Soviet motorized rifle regiment was made up of three motorized rifle battalions, a tank battalion, and its own reconnaissance, engineer, and air defense units. Its American counterpart, the battalion task force, was built around a tank or mechanized infantry battalion with its attached units. BMP was the acronym for the Russian *boyevaya mashina pekhoty* or armored vehicle infantry. A real BMP was capable of carrying eight soldiers plus crew. The OPFOR's fake BMPs could accommodate only four crew members. Quinn G. Johnson, "They All Hate the Bad Guys of NTC's Mojave," *Army*, June 1987, pp. 42-49. (7) James McDonough's book, *The Defense of Hill 781: An Allegory of Modern Mechanized Combat (Navato, California :Presidio Press, 1988)*, gives an excellent account of a unit's experience while facing NTC OPFOR.

motorcycles, a concept espoused by the Soviet military. During the 1984 fiscal year the NTC brought in four UH-1M helicopters for use by the OPFOR as surrogates for the Soviet HIND-D. However, before those aircraft could be visually modified to resemble Soviet aircraft, two of the UH-1Ms were involved in accidents. As a result, the UH-1Ms were replaced by the UH-1H. To complete their "bad guys" image, OPFOR soldiers wore specially designed OPFOR uniforms which featured dark green fatigues with red epaulets and black berets with an insignia of a red star in a red circle. The MRR shoulder patch also displayed a star within a circle. Members of the two OPFOR battalions carried Soviet-style small arms such as the AK-47 rifle.[12]

Personnel to serve in the OPFOR battalions were chosen from throughout the Army and assigned for a period of four years. OPFOR troops were trained to look, think, and act like Soviet soldiers at the U.S. Army Opposing Forces "Red Thrust" Training Detachment based at Fort Hood. Red Thrust was a FORSCOM training unit formally organized in January 1977 and dedicated to the dissemination of information about the Warsaw Pact threat. American military intelligence provided most of the OPFOR course material which was taken from Soviet publications and intelligence reports of Russian battles, especially in Afghanistan. The Threat Directorate at the Combined Arms Center provided OPFOR doctrine. Using Soviet Army manuals, soldiers learned formations, tactics, methods of attack and counterattack, Soviet unit organization, weapons identification, and command and control procedures. The surrogate Soviet soldiers also learned doctrine that stressed taking the offensive whenever possible and fast-moving, massive armored assault to overwhelm the enemy and gain both the military and psychological advantage. Like Soviet soldiers, American OPFOR soldiers were taught that there is no room for deviation from battle plans. Soviet battle tactics were based on straight-on attacks at approximately 20 miles per hour as opposed to American tactics which stressed stealthy maneuver.

OPFOR cadre employed sophisticated role-playing techniques in a series of political indoctrination classes to acquaint students with Soviet ideology and propaganda methods. Red Thrust training also employed an American Broadcasting Network documentary from 1968 entitled "Comrade Soldier" which followed a Soviet recruit from induction through training. OPFOR instructors were harsh and quick-tempered, but were not allowed to use physical punishment. Soldiers ate, slept, and lived like Soviet soldiers. In addition to this special training, the OPFOR also had to maintain proficiency as standard TOE units and meet the same ARTEP and tank gunnery standards as any other U.S. Army mechanized infantry or armor battalion. When training was completed, the OPFOR units

---

12 (1) Bolger, *Dragons*, p. 28. (2) Keays, "National Training Center," p. 6. (3)Johnson, " NTC's Mojave," p. 43. (4) MFR ATCG, General William R. Richardson, Cdr TRADOC, 7 Feb 84, subj: Visit to the NTC. (5) Jim Robbins, "Red Army," pp. 38-42. (7) Memo ATTG-ZA, Brig Gen Crowell, DCST, to General Starry, Cdr TRADOC, through Maj Gen Blount, CofS TRADOC, 6 Aug 80, subj: Where are We? Prepositioned stocks were the so called"POMCUS" (prepositioning of materiel configured to unit sets) equipment for U.S. reinforcing divisions arriving in Europe from the United States. In August 1980, Brig Gen Crowell cited cost estimates for VISMOD kits at $200,000, design requirements for modification of MILES kits at $159,000, and production cost for MILES at $500,000.

had become, in one soldier's words, "the world's biggest training aid." They were indeed an organization unique in U.S. Army history.

Few Blue Force commanders had reason to question the effectiveness of the 32d Guards' training in Warsaw Pact tactics and doctrine. OPFOR units repeatedly overran the Blue Force. "Awesome," "sneaky," and redoubtable" were adjectives frequently used to describe them. Remarks by members of one Army National Guard unit were typical: "They attack in droves, just like a foreign force. . . . There are so many of them and they exploit our weakness so well." "They use brute force to overrun us. . . . They're damn good. They'll send ten tanks to destroy one of ours. They don't care if they die."[13]

A favorite scenario employed by the OPFOR against the task forces training at the NTC was to arrange the three task forces of the motorized rifle regiment in a column. As the column approached the Blue Force position, the three OPFOR task forces came on line in three echelons. As the OPFOR moved still closer, the companies that made up each task force came line abreast, forming nine fingers. As the distance between the BLUFOR and OPFOR narrowed, the OPFOR companies fanned out to present a sort of rolling front. That mode of operations was designed to take advantage of the OPFOR's numerical superiority and to cause panic and confusion in the ranks of the Blue Force. As one observer of the OPFOR at Fort Irwin put it, "A target rich environment should be the American commander's dream, but dreams turn to nightmares at the NTC . . ." An OPFOR regimental commander described the common reaction of Blue Forces when first faced with the Soviet-style regiments: "Their first reaction is absolute amazement as 150 armored vehicles come at them at 20 miles per hour." A battalion commander with the 24th Infantry Division summed up the results after the division's first rotation in 1982: "Soldiers soon realize they have to do things right the first time since they don't get a second chance."[14]

In early 1981, prior to the opening of the NTC, the Human Resources Research Organization, working with ARI, studied two field exercises in which well-trained OPFOR groups participated. ARI had assigned the study group to determine, through the examination of field exercises involving OPFOR, what special training a unit should have before rotating to the NTC. The group was also to explore the effects of OPFOR training and portrayal on U.S. forces. The research team interviewed personnel from the 19th Armored Brigade who had participated in an exercise called, like the FORSCOM training unit, RED THRUST. They also interviewed participants in a Marine Corps test called Advanced Anti-armor Vehicle Evaluation (ARMVAL). The test director of ARMVAL, Col.

---

13 (1) Bolger, *Dragons*, pp. 20, 28. (2) Keays, "National Training Center," first quotation p. 7. (3) "The OPFOR Academy," *Army Trainer*, Summer 1985, p. 43. (4) Remaining quotations are from Strescino, "Swamp for Desert," p. 29. (5) Sp5 Steve Davis, "OPFOR: Life on the Other Side," *Soldiers*, Dec 1980. pp. 50-52. (6)Robbins, "Red Army." (7) Shackelford, "NTC Perspectives," p. II-5. The RED THRUST detachment moved from Fort Hood to Fort Irwin in mid 1988.

14 (1) Johnson, "NTC's Mojave," p. 48 (1st quotation). (2) *U.S. News and World Report*, 20 Sep 82, p. 62 (2d quotation).

R.H. Thompson, had concluded that the Marines' training was "woefully inadequate" to defeat a force he described as

> *simple, straightforward, and brutal. . . It is a "meat ax" approach to offensive combat with little concern for finesse or casualties for that matter. His intent is to blast through the main battle area (if he is not able to bypass it) and quickly get into his opponent's rear area.*

In a letter to the Commandant of the Marine Corps, Thompson summed up the tactical implications of his observations:

> *. . . with the Threat's doctrine of mass and rapid closure, action in the Security Area is now more critical than in the past. . . . We must accept the premise that on occasion we are going to have to fight the Threat, in numbers, to the rear of the Main Battle Area. That dimension of the battlefield also takes on added importance. . . . But in fighting Threat forces with their speed and numerically superior forces, Marines in the Main Battle Area are going to require much more help up front than before.*[15]

Based on Col. Thompson's judgment and the observations of other participants in the Marine Corps test, Army researchers warned U.S. force commanders that their units were not prepared to do effective battle with an OPFOR "unless they have trained against one before reaching the NTC." At the same time they cautioned the NTC management to resist pressures to "water down" the OPFOR to permit Blue Force units to make a good showing. The researchers were aware that there was genuine concern throughout the Army that the NTC might become an instrument for making or breaking the careers of battalion commanders rather than a training center to prepare units for combined arms warfare—that it might become a test rather than a learning experience. The Human Resources Research Organization-ARI report also warned that portraying the OPFOR could become monotonous for OPFOR unit personnel and take its toll on morale and motivation.[16]

Although learning, not winning battles, was at the heart of the NTC concept, the OPFOR's winning ways caused Army leaders to ask some hard questions. Was the quantitatively superior performance of the OPFOR a reflection of familiarity with the terrain and the training scenarios or an indication of inferior Blue Force tactics, training, or weapons? Was the fact that the Blue forces performed better on the defense than on the offense consistent with AirLand Battle doctrine that stressed tactical offensive in an operational defense campaign? There seemed little doubt that the OPFOR advantage was, at least in part, the result of repeated exercises over the same terrain with the same missions. And while rotating battalions could devote only two weeks to training at the NTC, OPFOR units spent 200 days a year in the field. Soldiers who spent fifteen days of every month together developed a strong camaraderie. The fact that the 32d Guards were trained in both Soviet

---

15 William L. Warnick and Norman D. Smith, The Impact of Opposing Force (OPFOR) on Friendly Force Task Performance with Implication for the National Training Center, Vol I, Discussions and Findings, Feb 1981, quotations on pp. 39 and 41.

16 Ibid., pp. vii, 23.

and American doctrine and tactics might also have affected their performance. And, of course, they all understood English, an obvious advantage on the radio networks. On balance, however, most informed observers were pleased to see such an effective training aid. Many took comfort in the real possibility that the U.S. Army OPFOR might in fact be better than their Soviet counterparts. In the simulated environment, it was assumed that the OPFOR were at peak capability and that all equipment and ammunition performed to specification, a situation seldom encountered on a real battlefield. As one senior Army official observed, "there is some potential for elaboration of Soviet tactics and—more significantly—development of [the] learning curve beyond realistic Soviet capabilities. . . ." A company commander put it more succinctly: "The OPFOR are the Russians as *they* wish they were." In any case, the presence of the surrogate Soviet soldiers made the NTC, in the words of a tank commander from Fort Hood, "the Super Bowl of mock war."[17]

No formal procedure for evaluation of the OPFOR, in terms of threat portrayal accuracy, was in use during the first phase of NTC implementation, as it was for the Blue Forces. The opposing forces evaluated themselves with assistance from the RED THRUST detachment and the TRADOC Operations Group. Early in FY 1982, some senior TRADOC officials expressed concern that that approach might hold "potential for subjective evaluation as a result of the exclusive FORSCOM nature of the NTC," and might lead to the abandonment of "red tactics in favor of blue." The TRADOC officials recommended that CATRADA and the Intelligence Center and School as the developers of the threat portrayal documentation be provided with video and audio recordings of OPFOR maneuvers so that an independent review of OPFOR activities could be made. Also suggested was that these data be provided to the Department of the Army Deputy Chief of Staff for Operations and Plans, DARCOM, and the TRADOC Deputy Chief of Staff for Doctrine, so that the data could be exploited to the fullest extent possible for "doctrinal and materiel refinement."[18]

Instrumented Force-on-Force Maneuvers

After a final briefing, soldiers of the Blue Force road-marched or drove to the assembly area to begin their first mission against the OPFOR. To avoid detection, and sometimes to avoid the intense heat of the day, task forces often moved into position at night. During the training exercise, the realistic battlefield environment—as well as the vast maneuvering distances together with the unit's organization at task force level—provided valuable insights into a unit's strengths and weaknesses. That information was then expected to aid in identification of the Blue Force's training needs.

For a period of two weeks the Blue Force operated in the dust and heat of Fort Irwin, on a smoke-filled battlefield with Cobra helicopters overhead, encountering obstacles of barbed wire, telephone poles, tank ditches, and minefields. Evacuation of casualties and damaged vehicles from the front lines could not be simulated—they had actually to be removed, accounted for, and replaced

17 (1) Simpson, et al, "Critique," pp. 42, 48. (2) First quotation is from Bolger, *Dragons*, p. 30. (3) Files, TRADOC Office of the Command Historian, Fort Monroe, Va. (4) Robbins, "Red Army," 2d quotation.

18 Files, TRADOC Office of the Command Historian, Fort Monroe, Va.

at the end of each battle. If rations and ammunition did not reach the front, the troops did without. And always there was the dreaded OPFOR waiting to begin their next mission. As one anonymous infantryman summed the enemy threat up: "It's one thing to hear about the Soviet tactics, but really something else to actually see it." All too often, a battlefield shrouded in smoke and dust, together with jammed communications, produced confusion and panic. Lack of time was a constant concern. One problem almost all units had was that at the end of each mission, there were three competing things to do. At the same time forces were trying to reconstitute, resupply, and reorganize, they had to attend the after action review and begin planning for the next mission. With only fourteen days available for training during each rotation, NTC cadre were determined that no time be wasted.[19]

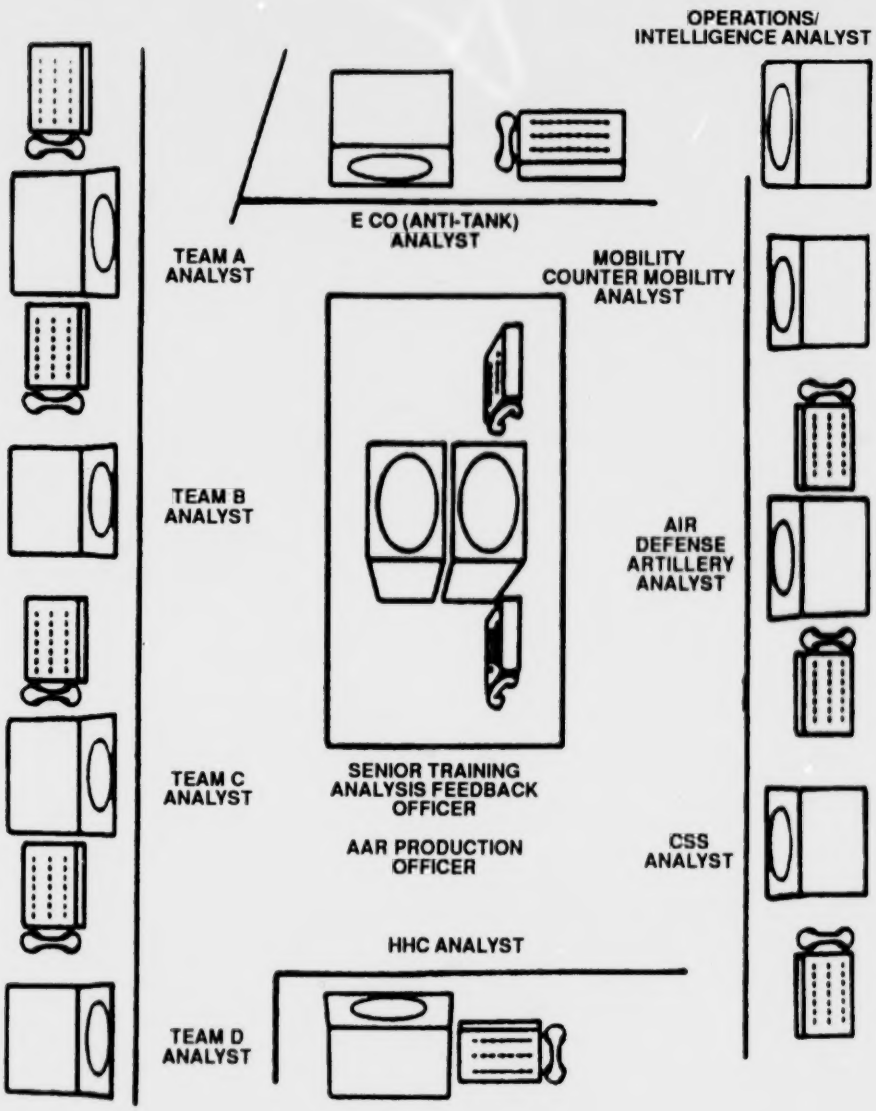
The live-fire exercises and force-on-force maneuvers provided the realistic battlefield experience necessary to produce combat ready soldiers. But the NTC had another major objective. That was to design a system of training evaluation that could provide an objective assessment of a unit's proficiency and aid in identifying training needs.

We will now describe in greater detail how the instrumentation system worked during a typical cycle. From the beginning, as we have seen, NTC planners had envisioned the employment of high technology to create an instrumentation system capable of collecting, analyzing, and integrating information from the battlefield. The core instrumentation subsystem (CIS) and its supporting systems have already been described. The custodian of the NTC's sophisticated Instrumentation system was the TRADOC Operations Group, usually referred to as the "ops group." The Operations Group was composed of an exercise management and control (EMC) section and a training analysis and feedback (TAF) section (Chart 6). Exercise control personnel were stationed in the Operations Center—known as the "Star Wars Complex"—which contained the computers and other equipment of the CIS. Their primary responsibility was control of the training environment, which included the OPFOR, airspace clearance, and radio frequency spectrum management.

The second part of the Operations Group, the training analysis and feedback section, included personnel located both in the field and in the Operations Center. TRADOC field observer-controllers, the "OCs," were responsible for recording non-instrumented unit actions and for monitoring maneuver operations and staff actions. Specially selected and trained, these officers and sergeants were detailed to each unit down to platoon level and moved with each unit in the field. During an exercise, the OCs also became an extension of the OPFOR as they provided simulated artillery and chemical attacks using smoke grenades, flares, non-lethal hand grenades, and ground burst simulations. They also used handheld laser guns—often called "God guns"—to contribute to the casualty list by "destroying" tanks and personnel who violated doctrine. The remaining members of the training analysis and feedback section monitored the equipment in the Operations Center and were

19 (1) Brown, "Learning the Hard Way," pp. 14-19, quotation on p. 15. (2) Word, "Observations," pp. 4-5.

Chart 6
ORGANIZATION OF TRAINING ANALYSIS AND FEEDBACK TASK FORCE ANALYST UNIT



Source: William L. Shackelford, "NTC Perspectives," p. V-8.

responsible for the input of data from the field and data processing by the CIS. They worked in separate but identical task force instrumentation rooms called CIS 1 and CIS 2, each of which was paired with one of the two task forces.[20]

The NTC Operations Center resembled a dimly lighted video arcade, but the pictures and figures on the television screens and display terminals represented real combat vehicles engaged in the mock battle. Operators sat at stations which featured a video display terminal, a computer keyboard, and a color television set. By entering a combination of commands, the operator chose from a wide variety of background maps and weapons and sensor performance displays, all in color. He could choose from among contour lines, roads, rivers, urban areas, or historical combat information overlays. Against those backgrounds the operator then produced an accurate portrayal of the battle taking place in the field. The data processing and display software was capable of providing information on the locations of units and command posts, troop concentrations, heavy weapons positions, the number of shots fired by caliber, and hits and misses. Blue Force and OPFOR tanks appeared on the screen as blue and red tanks, respectively. When an OPFOR tank fired upon and struck a blue tank, a solid slack line showed the path of the shot, and the blue tank appeared in a black box to indicate it was out of action.[21]

By the end of phase I implementation, the instrumentation system was capable of tracking 500 vehicles—half Blue Force and half OPFOR—in concert with the NTC's position location system discussed earlier. Suffice it to repeat here that the information on a vehicle's whereabouts was transmitted by microwave to receivers either on Fort Irwin's centrally located Tiefort Mountain which serviced force-on-force exercises in the NTC's southern corridor, or to a receiver in the Granite mountains that served the force-on-force exercises in the central corridor and the live-fire exercises. The signal was then relayed by coaxial cable from one of the receivers to the Operation Center's computers. A blue or red symbol for the located vehicle appeared on the screen and, since information on its location was constantly changing, it appeared to move. At the same time, the Multiple Integrated Laser Engagement System was monitored. The MILES-received information, when relayed to the computers, produced graphic displays of each shot and printouts that recorded firing data in relation to time, weapon, range, and results (Chart 7).[22]

Just above the display screens, another screen disclosed the actual battle from various angles and distances. Those pictures came from a battery of television cameras in the field. Located on Tiefort and Granite mountains were high resolution cameras with a range of twenty miles. Remotely controlled from the CIS, they provided coverage of 99 percent of the training area. Eight mobile video

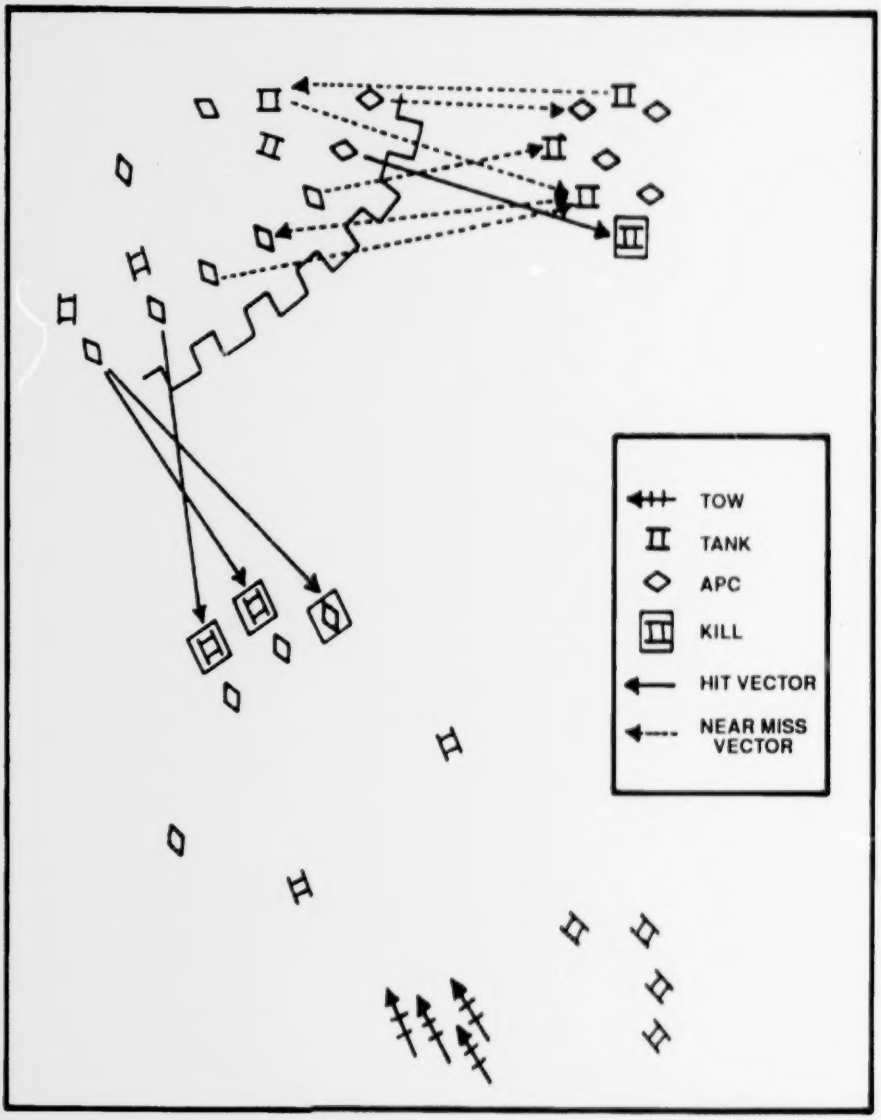
---

20 (1) Simpson, et al, "Critique," p. 1. (2) Bolger, *Dragons*, p.72. (3) Shackelford, "NTC Perspectives," p. V-7. For organizational charts and a discussion of the organization of the TRADOC Operations Group see Chapter 4.

21 (1) L. James Binder, "The War is Never Over at Fort in the Mojave," *Army*, Apr 1983, pp. 31-32. (2) U.S. Army Research Institute for the Behavioral and Social Sciences, Presidio of Monterey Field Unit Training Research Laboratory, National Training Center Data Handbook, July 1984, pp. 3-5.

22 (1) Binder, "Fort in the Mojave," pp. 31-32. (2) SFC Michael Brown, "Live From NTC — Its the War," *Soldier*, Feb 1984, pp. 26-28.

Chart 7
NTC OPERATIONS CENTER
GRAPHICS DISPLAY



Source: William L. Shackelford, "NTC Perspectives," p. VII-12.

units (four to each task force), mounted on modified trucks and manned by an NCO and an audiovisual specialist, also furnished live television coverage. The OCs directed the positioning of the video units to capture, for later analysis, unit actions that had a major influence on the outcome of the battle. Besides the cameras, the vehicles carried video recorders, audio equipment, and transmitters. The fixed video team operated the cameras and did a running commentary on the force-on-force maneuvers. Analysts in the Operations Center could choose to view any of the units or request a different view by contacting the field units. Normally the senior training analysis and feedback officer was concerned with the battle as a whole, while the company analysts captured the battle in greater detail.

Operations Center personnel also received live coverage from the tactical operations center (TOC) vehicles that simulated division headquarters at the NTC. The battalion commander issued his orders and instructions to his company commanders based on information received from division headquarters. That information was relayed through the TOC to the computers. During the battle, cameras at the TOC televised the actions and decisions of the division commander and his staff. To allow Operations Center personnel to see what the gunner saw, the sights of seven randomly selected tanks were replaced with video cameras and audio equipment. The instrumentation system also provided for video and audio coverage of the live-fire exercises, although the electronic monitoring was not as extensive as for the force-on-force maneuvers.[23]

Communications were also monitored and recorded, during maneuvers at the NTC. A training analyst at the Operations Center could at any time listen to any of forty tactical radio communications channels and record this information in the computers. The instrumentation system also allowed for graphic displays of communications data such as time and length of transmissions. Radio transmissions displays were used to create an awareness of the communication security posture of the force. It was an accepted fact that the Warsaw Pact armies had the capability to quickly determine the location of communicators and place effective indirect fire on the transmitting site. In addition, lengthy transmissions increased the vulnerability of the radio networks to jamming by the OPFOR. Ability to monitor and record radio traffic during maneuvers allowed communications analysts to assess radio discipline and the amount of stress placed upon a task force communication system during battle.[24]

The purpose of the graphics and audio recordings was to allow the training analyst at the Operations Center to evaluate unit performance. Using that data and the observations of the OCs, which were manually entered into the data system, he assessed the significant events of the engagement and the mistakes a unit made. He then entered them on the keyboard at his station. He watched for proper positioning and maneuver, use of concealment, and the breaching of obstacles,

23 (1) Binder, "Fort in the Mojave," p. 31. (2) Brown, "Live From the NTC," p. 27.
24 Shackelford, "NTC Perspectives," pp. V-17 to V-19.

and listened for breaks in security on the radio networks. His notes then formed the basis for a review of unit performance to insure that the mistakes made at NTC would not be repeated in actual combat.

NTC officials continually emphasized that the NTC should never provide a win or lose situation for rotating battalions; rather it should provide a training experience. The NTC was not a test, and it provided no scores. Evaluations were not forwarded to higher headquarters but remained with the unit. NTC personnel were not allowed to compare one unit's performance with that of another. The task force's test would come in the event of war.[25]

There was no such thing as a "typical" maneuver mission at the NTC. However, the description of a hypothetical "movement to contact" can serve to demonstrate the interaction of the TRADOC and FORSCOM elements as well as to explain the decision-making processes. The objective in a movement to contact was to find the enemy, test his position and strength, and act before he could react to the approaching force. Most offensive operations began with a movement to contact which was characterized by a lack of information about the enemy. Division and brigade operations orders were issued in the rear area, after which commanders and special platoon leaders briefed their subordinates. After initial reconnaissance, Blue Forces deployed to a forward assembly area in accordance with orders. At the same time, the OPFOR—directed by the exercise management controllers (EMC) and training analysis and feedback (TAF) personnel of the Operations Group—set the stage for the force-on-force confrontation. As the defensive positions were prepared and enemy obstacles set, the EMC and TAF groups monitored the OPFOR via the instrumentation system and entered the location of obstacles into the data base for display on the color graphic monitors. During the battle, the NTC Operations Group acting as a notional division headquarters also provided situation information to the Blue Force. Meanwhile OPFOR reconnaissance elements conducted counter-reconnaissance screens, and the Blue Forces released their scouts to perform route, area or zone reconnaissance. During exercises, both task forces, the direct support artillery battalion, and the brigade support elements were under command and control of a brigade headquarters operating from a tactical operations center in the field. From the TRADOC Operations Center, the EMC transmitted scenario intelligence information to the brigade operations center. As noted above, each unit down to platoon level had its own OC to both participate in and evaluate the force-on-force maneuvers.[26]

When the Blue Forces began their movement to contact, OPFOR front line aviation elements conducted air strikes against them. The EMCs transmitted early identification of the enemy air threat to brigade command and to the task forces over the division early warning system. The Blue Forces forward area alert radar could then make positive identification of the attacking OPFOR aircraft. If the force took appropriate and effective air defense actions, the OC directed the EMC to notify the OPFOR aircraft to leave the area and assessed the destruction of the aircraft. If the task force air

25 Brown, "Live From the NTC," p. 27.

26 (1) Shackelford, "NTC Perspectives," pp. VI-10 to VI-11. (2)Bolger, *Dragons*, pp. 83-84. (3) Department of the Army, FM 71-1, The Tank and Mechanized Infantry Company Team, Coordinating Draft, April 82, p. 4-3.

defense elements had not responded satisfactorily, the OCs assessed vehicle casualties. As casualties were assessed, medical aid and evacuation and remedial maintenance had actually to take place under the watchful eyes of the OCs.[27]

During the battle, the artillery battalion responded to the task force's preplanned indirect fire support as well as to spontaneous calls for fire. The Operations Center artillery controllers monitored those activities and directed the fire markers in the field to activate smoke generators to simulate hits at the target locations. Any OPFOR within the impact points were assessed as casualties. OPFOR fires against the Blue Forces were marked by the OCs moving with the task force as directed by the Operations Center controllers. When an artillery "footprint" appeared on the company training analyst's video monitor over elements he was observing in the Operations Center, he notified the company OC moving with the Blue Force. The company OC, in turn, directed his platoon OC to activate the artillery burst simulators. Casualty assessment was made against task force personnel and vehicles when flagrant violations of appropriate defensive actions occurred.[28]

As the forces closed within direct fire range of each other, the maneuver battle began. According to Army doctrine, in a movement to contact initial contact had to be made with the smallest possible force, allowing the remainder of the task force to maneuver to defeat the enemy. During this phase of the battle, the Blue Forces received close air support from Air Force aircraft targeted by their forward air controllers against the OPFOR. Assessment of unit performance, and vehicle and personnel casualties, depended on the MILES weapons effects supported by artillery, air, and minefield effects. AH-1 helicopters brought into the battle in support of the Blue Forces were equipped with TOW, cannon, and rocket MILES. All helicopters were equipped with MILES sensor belts and hostile fire hit-kill simulators. As Blue Force vehicles were hit, the OCs attached placards to them indicating the extent of damage caused by OPFOR direct fire. If a vehicle was catastrophically destroyed, no placard was placed on it, an indication that it was unsuitable for repair or evacuation. The number of damaged and killed vehicles was left to the judgment of the senior OC and depended on his knowledge of the mission-ready status of combat vehicle systems. Assessment of a reasonable number of damaged vehicles was designed to exercise the combat service support system of the task force consistent with the achievement of mission objectives. Soldiers within MILES-equipped vehicles were issued casualty cards with predesignated casualty status marked on them. If his vehicle was hit or killed, a soldier suffered the casualty marked on his card so that medical treatment or evacuation could occur consistent with his condition.[29]

When the first phase of the implementation of the NTC ended in 1984, no MILES technology existed for automatic simulation of the effects of antitank or antipersonnel mines. In its absence, the training analysts in the Operations Center assisted the OCs in the field in monitoring the Blue Force

27 Shackelford, "NTC Perspectives," p. VI-11.
28 Ibid., p. VI-12 to VI-13.
29 Ibid., pp. VI-13 to VI-14.

approach to OPFOR minefields. When Blue Force vehicles and personnel entered the minefields, the OCs indicated hits and kills by using their MILES controller guns to put those elements out of action.[30]

NTC battles were allowed to continue until, in the opinion of the chief of the Operations Group and the senior OC, the task force had prevailed or its combat power had been reduced to 30 percent of its organic assets—making it combat ineffective. As a battle reached its conclusion and its outcome became clear, the exercise controllers issued instructions to the controlling brigade to order the task force to consolidate on the objective if it could. If it could not, it received a "halt and defend" order to seek the best available defensive terrain and go on the defensive. The OPFOR then broke contact and retreated from the area leaving only a small security and reconnaissance force to keep in contact with the Blue Forces.[31]

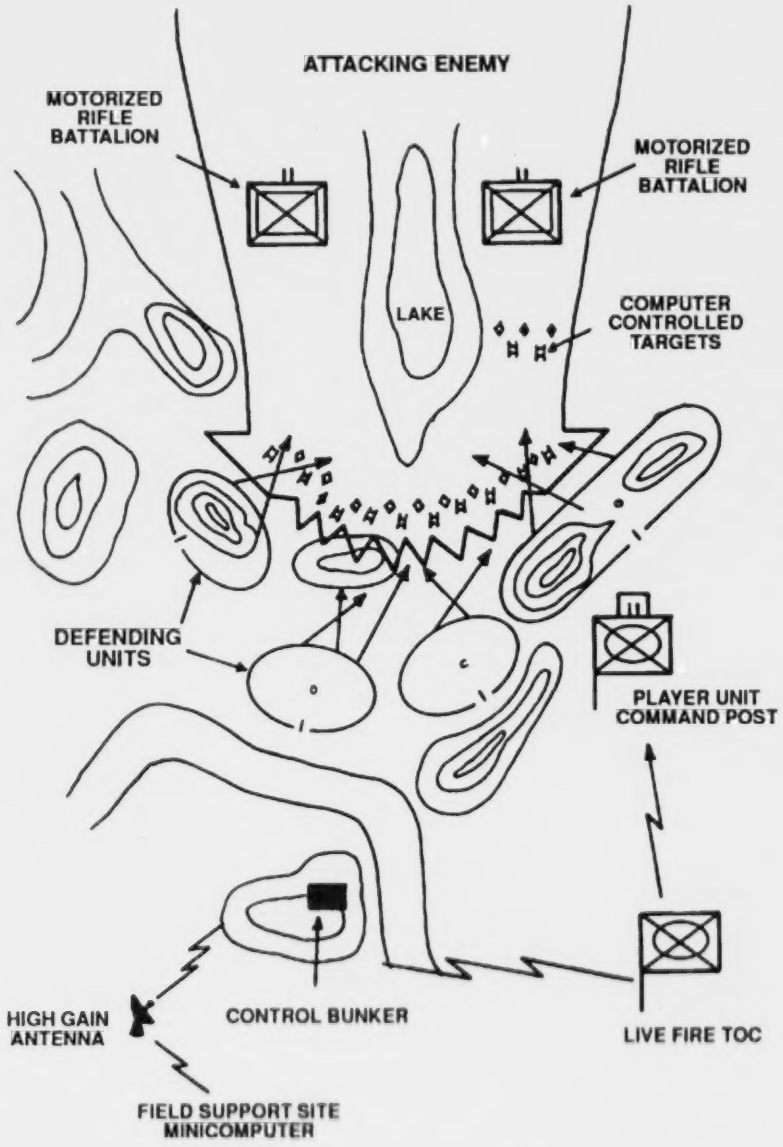
Live Fire Exercises

At some time during its rotation, a unit traded in the MILES transmitters on their machine guns, tank main guns, and M16 rifles for real ammunition and moved to the live-fire range. There they took part in three operations—a daylight defense, a night defense, and a daylight attack (Charts 8 and 9). During the two defensive scenarios, rows of black silhouette targets, representing infantry and vehicles, popped up one row at a time, simulating the advance of a massed enemy. Live-fire cadre controlled the computer-driven target scenario from a control bunker. Although the targets were stationary, they were raised and lowered in such a way as to create the illusion of a Soviet motorized rifle regiment closing at the rate of 12 kilometers per hour. To create the effect of enemy fire, exercise controllers used artillery burst simulators, gas grenades, and shots from their MILES controller guns. The targets appeared to "fire" by giving off flash signals, and sent up oily smoke clouds when "killed." Smoke also replicated the rising desert dust churned up by the advance of the enemy's tracked vehicles. Because of the prohibitive cost of ammunition firings for some systems—TOW, Dragon, and LAW—were simulated by using MILES laser devices against sensors placed on the targets moving across the live-fire range. When Abrams tanks and Bradley Fighting Vehicles were exercised at the NTC late in FY 1984, thermal targets configured to represent Soviet T-72 tanks and BRDMs were procured for their use. All targets included devices to register hits and controls to stop dead targets in place. Blue Force commanders knew they were in trouble when targets appeared behind them. To prevent that occurrence, commanders had the option of calling in Air Force close air support.[32]

The day offensive scenario featured more than seventy targets located on a 30-kilometer range that represented a Soviet security zone. The live-fire OCs moved with the task force and controlled the targets via radio signal transmitters. The range also included minefields and obstacles. In order to

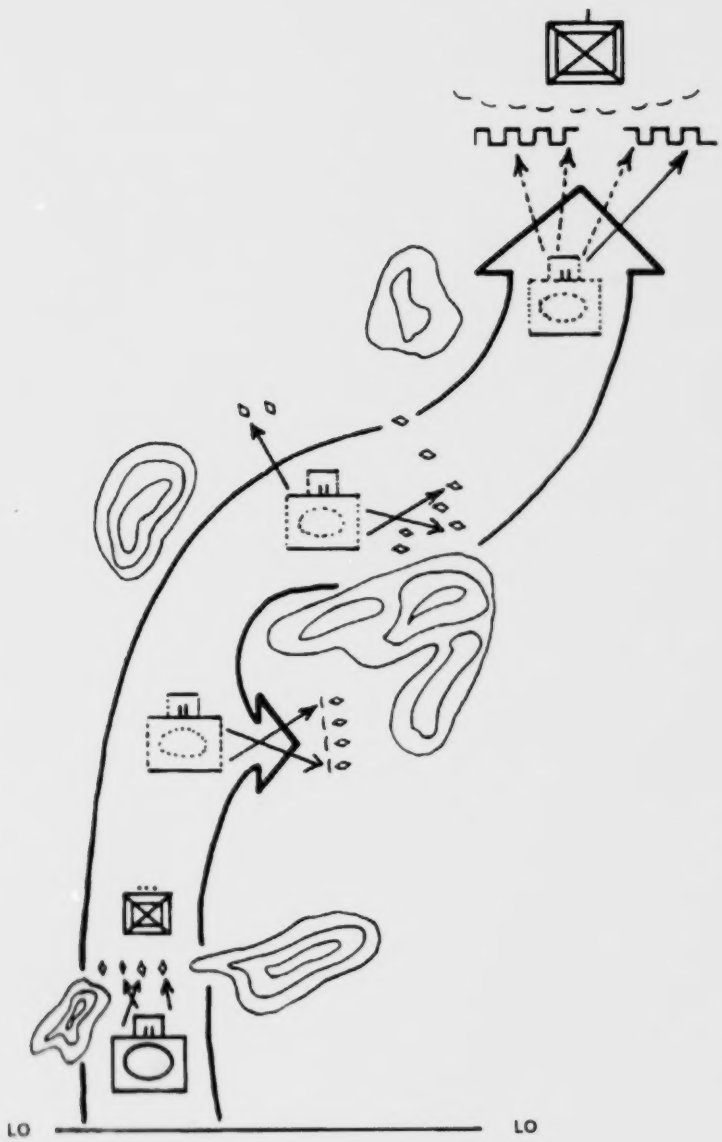
30 Ibid. IV-5.
31 Ibid, p. VI-14.
32 (1) Bolger, *Dragons*, pp. 70-71. (2) Semiannual Historical Report, ODCST, Apr - Sep 84, p. 140.

Chart 8
LIVE-FIRE DEFENSE FACILITY



Source: William L. Shackelford, "NTC Perspectives," p. IV-6.

Chart 9
LIVE-FIRE OFFENSE FACILITY



Source: William L. Shackelford, "NTC Perspectives," p. IV-8.

penetrate the zone, the field artillery had to provide a pass through the hills that surrounded the battlefield, and engineers had then to clear the pass of mines and wire. The mines were ceramic, but soldiers used real explosives to clear them. Once on the battlefield, troops had to negotiate the desert floor and climb into the hills to take the enemy position at the summit. From there they descended again to the valley floor along a road just wide enough for a tank. Should a tank become stuck in a ditch or otherwise block the road, the rest of the unit was stranded. Completing the final leg of the course involved negotiation of a barbed wire fence protected by minefields and tank ditches. If the unit did not quickly breach the obstacles, it was vulnerable to a successful enemy attack. National Training Center developers continuously sought to improve the live-fire range, concentrating especially on problems with the reporting of target status and the matching of firer to target.[33]

After Action Reviews and Take Home Packages

At the National Training Center the principal learning experiences were the after action reviews (AAR) that took place as soon as possible after each force-on-force and live-fire mission and at the end of a unit's rotation. The AAR was an integral component of the Army's "train-evaluate-train" philosophy that was the result of the post-Vietnam era training revolution. The NTC's OCs conducted debriefings at platoon, company, and battalion level. In the early years of NTC operations, AARs were based on the OC's observations. In the summer of 1983, the results of the instrumented actions were integrated into the task force AARs, allowing use of the data collected during the battle, as well as videotapes, and audio recordings. Those elements were added to the analysts' notes the Operations Center provided. The observer-controllers at the NTC were trained in a program developed by the Combined Arms Training Development Activity (CATRADA), and most, ideally at least, were doctrinal experts and experienced in the development of the skills they evaluated. They were assumed to be good at the METT-T (mission, enemy, terrain, troops, and time available) analysis that contained the factors commanders weighed to assure that doctrine was applied properly in combat. In accordance with the seven battlefield operating systems that defined how a heavy battalion task force would fight, observer-controllers pointed out each unit's successes and its shortcomings.[34]

The OCs first conducted post-mission AARs for the company leaders, presenting battle loss data, ammunition status, and their own impression of the company's performance. After the company AAR, the debriefing continued at platoon level with all soldiers participating. Company and platoon level AARs were held in the field approximately one to two hours after the end of a mission. Finally,

---

33 (1) Bolger, *Dragons*, p. 71. (2) Brown, "Learning the Hard Way," p. 19. (3) Information Booklet, TRADOC Commanders Conference, 26-29 Nov 84. (4) For a discussion of the development, testing and problems of the live-fire range, see above, pp. 73-75.

34 (1) Bolger, *Dragons*, p. 73. (2) Furman and Wampler, "Methodology," pp. 44-46. (3) Department of the Army, FM 71-2, *The Tank and Mechanized Infantry Task Force*, 30 June 77. (4) Capt William G. Webster, Jr., "Using U.S. Army National Training Center (NTC) Lessons Learned to Improve Combat Readiness" (M.A. Thesis, Advanced Military Studies Program, U.S. Army Command and General Staff College, 1984), p. 50 (hereafter cited as Webster, "Lessons Learned"). (5) Shackelford, NTC "Perspectives," pp. VII-1 to VII-16. (6)Combined Arms Center Annual Historical Review, 1986 (chapter on the NTC was authored by Dr. Rodler F. Morris), p. 163.

the battalion AAR was conducted for company commanders, the battalion commander and his staff, and the leaders of all attached units. Often the brigade leaders, the assistant division commander, the chief of the Operations Group, the divisional commanding general of the rotation battalion, and the NTC commander also attended. Initially the post-mission AARs had no prescribed time limit. However, in 1984, over the TRADOC commander General Richardson's strong objections, the FORSCOM commander directed that the AAR be limited to two hours. In the NTC's early months of operation, task force post-mission AARs had been conducted in the field with participants exposed to the elements. In the summer of 1982 expandable vans capable of seating twenty-six persons became available. The vans provided not only protection but the opportunity to use projectors, cameras, and communications equipment in AAR presentations.

At the task force level, putting together an AAR could be a complicated task for the senior OC. It was necessary that he confer with all his company level OCs, as well as with the observers for battalion fire support, intelligence, operations, and combat service support. Representatives of the OPFOR, and sometimes the Air Force observer, also were debriefed to obtain their assessment of the planning, preparation for, and execution of the battle. The senior OC then had only two hours in which to compress all the information into a coherent analysis of a unit's performance. Back at the Operations Center he worked with the training analysts in order to, in the words of one senior controller, "build the best sound and light show I can to illustrate the points that should be made." During the AAR itself, the senior OCs explained errors in application of doctrine, in judgment, and in execution, and the OPFOR leaders examined the exercise from their point of view. Criticism was often harsh. It was, however, intended not as punishment but as a learning experience.[35]

The guidelines for conducting task force AARs, as set forth in the NTC Development Plan in 1979, differed somewhat from the procedures described above. Originally, AAR preparation and presentation had been designated the responsibility of the Training Analysis and Feedback Officer (TAFO). But, because the instrumentation system had not been ready for use when field training began at the NTC, the TAFO had no means of fulfilling that responsibility. That being the case, the senior OC conducted the AARs based on his field observations. Even when the instrumentation system became available to record and aid in training evaluation, having the TAFO prepare and conduct the AARs proved unsatisfactory. The most workable solution to the AAR problem proved to be the combination of the capabilities of both the OCs and the TAFO to produce complementary insights concerning unit activities. Contrary to the Development Plan, the senior OC was designated the AAR presenter. He was to be assisted in his preparations by the TAFO who had immediate access to the Operations Center data base.[36]

---

35 (1)Shackelford, NTC Perspectives, pp. VII-1 to VII-16. (2) Bolger, *Dragons*, p. 73. (3) Word, "Observations," pp. 40-42. (4)MFR, General William R. Richardson, 1 Aug 83, subj: National Training Center Executive Committee Meeting, 28 June 83, Richardson Papers.

36 Shackelford, "NTC Perspectives," pp. VII to VII-7. The 125 player system of the Phase I instrumentation system was not delivered until March 1982.

After completion of the mission, the battalion level participants gathered inside the AAR van. While the TAFO projected brigade mission graphics onto a screen, the senior OC had the brigade commander restate the mission and the guidance he had given to the battalion/task force commander. Following that, the battalion commander explained his scheme of maneuver using mission, enemy, terrain, troops available, and time considerations as a framework. Next the senior OC examined the mission chronologically and progressed through the major discussion areas selected during the mission planning stage. That completed, the OC, in a dialogue with the task force participants, identified events important to the outcome of the mission and led the group to the doctrinal solution and correction of any problems.

AARs were conducted as objectively as possible, including the identification of individual mistakes if necessary. There was considerable concern throughout the Army that this so-called "black hat" approach might be damaging to the chain of command. The Chief of the NTC Operations Group, Col. Shackelford, however, emphasized the leadership training advantage. In a 1985 perspective, Shackelford believed that:

> *the direct approach causes the task force leaders and staff to recognize their tactical and technical responsibilities and creates corrective action and learning in short order. It further strengthens the chain of command because the best, and at times, the worst within the leadership surfaces under the stress of battle. The true measure of the command and staff climate is revealed and the good and strong emerge to take charge within the two weeks of training. Those who faked competence at home station are revealed during the NTC experience.*[37]

The senior OC for mechanized infantry forces at the NTC for three years, Col. Larry Word, in a 1986 interview, agreed with Shackelford. Word believed that "having the chain of command involved in these After Action Reviews is the best thing that has happened to the Army." He was critical of suggestions that only the task force commander and the OCs should attend AARs, to avoid putting pressure and "heat" on commanders. Pressure, the former senior OC maintained, was exactly what was needed if the senior leadership was to go back to home station and restructure the training program from platoon through division level. Word cited the story of a division commander who returned to his division after its first battalion rotation at the NTC to tell his G-3 officer to throw away a voluminous five year training plan on the grounds that they had obviously been doing the wrong things. The NTC experience, Colonel Word maintained, caused divisions to completely rework their training plans because "the chain of command understood that part of the problem was theirs."[38]

To a degree, controversy over the "black hat" approach to training evaluation became, over time, a "we versus they" issue at the NTC. Writing several years later, retired Lt. Gen. Frederic J. Brown, a former Deputy Chief of Staff for Training at TRADOC, expressed his belief that TRADOC saw the

37 Shackelford, "NTC Perspectives," p. VII-8 to VII-9.
38 Word, "Observations," p. 38.

AAR as the "crucible of requisite training and evaluation," but to average FORSCOM commanders it was "an absolute zero sum game-winning-promotion-losing relief." TRADOC had to reckon with FORSCOM chain of command concerns. Lt. Gen. Brown went on to explain his belief that the "truly revolutionary characteristic of the NTC" served to increase controversy over the conduct of AARs. "No other army in the world exposes its unit chain of command to a no holds barred 'battle' against an OPFOR controlled by another chain of command where if you 'fail' as a leader it is evident in exquisite detail to your soldiers. . . . No army—including the Israeli Defense Force—has dared to do this."[39]

Col. Word, the senior observer-controller earlier cited, also perceived an unresolved element of tension with regard to AARs and the NTC's training goals. The NTC staff would like to have had well rested and alert leaders in attendance at the after action debriefings. However, long breaks for sleep lessened the realistic stress trainers were trying to simulate. How did one maintain stress on a unit and, at the same time, do the best possible job of training?[40]

The task force AAR concluded with charts summarizing the significant mission events categorized under the seven battlefield operating systems. Chart 10 displays one such chart:

Chart 10
AFTER ACTION REVIEW CHART

SYSTEM: Maneuver

SIGNIFICANT EVENTS: Attack lost momentum

REASON: Main effort not discussed. Insufficient combat support elements designed as main attack to penetrate enemy defenses.

EFFECT: TF attack was unsuccessful. TF did not accomplish mission. TF lost 2/3 combat power.

Source: William L. Shackelford, "NTC Perspectives," p. VII-9.

39 Ltr, Lt Gen Frederic J. Brown to the author, 2 January 1991 (all quotations).
40 Word, "Observations," p. 5.

At the end of 1984 the NTC instrumentation system had not matured to its full capability to support after action reviews. As a result, such charts were used to perform some of the functions that would in the future be instrumented. When the system was fully operational according to design, color graphic and firing summary data would allow identification of critical events from the data base and clearly reveal any catastrophic errors in execution. The enhanced capability would allow for the correction of deficiencies immediately during training and would give the chain of command greater insights into the application of doctrine to task force maneuvers in the field.[41]

Not all AARs at the NTC addressed combat arms issues. In 1982 the Commander of the Logistics Center requested that combat service support (CSS) evaluations also be a part of the NTC experience. The request was accepted. As a result, task force personnel charged with logistical and maintenance support received AARs every three days covering such activities as CSS organization, the commander's planning guidance, the regeneration of combat power, and the supply status of essential food, water, clothing, fuel, ammunition, and repair parts. The CSS observer-controller was responsible for evaluation of CSS functions and for presentation of the AAR. Unlike his combat arms counterparts, he did not have instrumentation support.[42]

At the end of the two-week training cycle, each rotating battalion received a final critique of its performance. Those evaluations were usually held at the Operations Center and included both visiting battalions. At that time a unit's total record of errors and successes was weighed against the seven operating systems, and the NTC commander urged unit leaders not to allow the experiences of the NTC to be forgotten upon return to home station. To assist battalion training managers in applying the lessons learned to their training programs, each battalion received one of the NTC's most important products — the take-home package, or THP. The brigade commander received THPs for both battalions. Prepared by the training analysts and OCs in the TRADOC Operations Center, the packages included summaries of each daily mission, an analysis of trends across the seven battlefield operating systems, copies of the video and sound recordings, and a written report made up of basic statistics such as casualty figures, equipment loss tables, and gunnery tables. Videotapes of all AARs, observer-controller comments, and descriptions of how unit behavior was consistent with doctrine and how it had failed to conform to doctrine, were also included. To prevent comparison of one unit's performance with another and to protect anonymity—in short, to preserve the NTC as a training rather than a career enhancing experience—only one copy of the tapes was developed and the task force received that copy. The brigade commander and the task force commander each received copies of the written portion of the package. In addition, copies of the THPs with all identification removed were provided to the Combined Arms Center and to the Army Research Institute for the Behavioral

41 Shackelford, "NTC Perspectives," pp. VII-10 to VII-15.
42 Shackelford, "NTC Perspectives," p. VII-15 to VII-16.

and Social Sciences (ARI) to make possible the analysis of collective data. While the principle of non-attribution likely did serve to keep the focus on training, at least one battalion commander, while trying to prepare his unit for a rotation at the NTC, decried the inability to profit from others' experience and to identify "anyone to go talk to who actually did the learning." In his estimation, "the overall effect is to curtail the learning potential of the system significantly."[43]

Because the AARs did provide the NTC's principal learning experience, in early 1984, TRADOC commander General Richardson expressed concern that they were, or might be, misused. In the first place he was anxious that the AAR not become "a final report card on a battalion commander," thereby enhancing career gamesmanship and diluting the training experience. He also strongly cautioned those members of the TRADOC Operations Group responsible for AARs not to become inflexible in the application of doctrine. While admitting the need for written doctrine, he believed commanders should not be criticized for violating doctrine when the unit had applied a variation in tactics and techniques that worked. The NTC, Richardson remarked, must not be allowed to become the "National Dogma Center" because the Army "will never build ingenuity or risk-taking this way." The TRADOC commander also suggested that the field manuals used to train soldiers might need revision because they did not reflect maneuver doctrine but rather tended to return to the active defense.[44]

NTC Observations

Rotating battalions, force-on-force and live-fire training, instrumented training evaluation, the OPFOR, air-ground operations, after action reports, and take-home packages—those were the essence of the Army's unique training center in the Mojave Desert. The NTC experience was different for each unit, but a number of common themes ran through the observations and comments of soldiers who had trained there. Everyone noted the effects of the desert environment. Temperatures fell to as low as 10 degrees in winter and rose to 120 degrees in August. Heat-related medical problems were common. Adequate supplies of water were a constant concern. Lack of any but scrub vegetation made concealment nearly impossible and contributed to the pronounced tendency of soldiers to become lost. As one tank commander put it, "You can drive for miles and still feel like you're in the same place." In fact, soldiers became lost so often that troops adopted an expression for it—LID, "lost in desert."[45]

---

43 (1) Bolger, *Dragons*, pp. 311-313. (2) Simpson, et al, "Critique," pp. 3-4. (3) Shackelford, "NTC Perspectives," pp. VIII-1 to VIII-2. (4) Word, "Observations," pp. 5, 31. (5) Col John W. Norris, "Lessons Learning - The Army System," USAWC Military Studies Program, U.S. Army War College, 16 Jan 90, pp. 6-7 (both quotations).

44 MFR ATCG, General William R. Richardson to distr, 11 Jan 84, subj: Visit to 4th Infantry Division (Mechanized); MFR ATCG, General Richardson to distr, 7 Feb 84, subj: Visit to the National Training Center, both in Richardson Papers.

45 (1) Sp 5 Peter Strescino. "Swapping Swamp for Desert," *Soldiers*, Feb 1984, p. 29, quotation on p. 29. (2) PFC Randy Schaefer, "Task Force Battles in Mojave," *Army Trainer*, Summer 1986, pp. 21-23.

Another frequent comment was that there seemed to be no time at the NTC for sleep. Battalion commanders quickly found out that they had to sleep in order to maintain the ability to accomplish the current mission, not to mention the next one. One senior OC regarded the situation as more positive than negative. Far too often leaders usurped the authority and responsibility of soldiers several levels below them in the chain of command in order to minimize if not eliminate errors. "In that environment platoon leaders and squad leaders quit doing things because the boss is going to take care of it." The result of leaders doing not only their own jobs but those of other people was the stifling of initiative. At the NTC commanders were immediately faced with the problem that they not only could not do anyone else's job for them, but they had to develop subordinates to take over during sleep periods.[46]

With regard to the training missions, many units encountered common difficulties. The reconnaissance techniques of Blue Force battalions often stood in sharp contrast to the thorough intelligence procedures of the OPFOR. Blue Force scout platoons—meant to find the enemy, not engage him—too often became involved in combat, causing intelligence officers to lose their "eyes" in the field. Further, intelligence efforts tended to focus more on what the OPFOR should be doing according to Soviet doctrine than on where they were and what, as a flesh and blood opponent, they actually were doing. It quickly became apparent to training analysts and ultimately to rotating units that the "battle before the battle"—the activities of opposing reconnaissance units—was critical to success in the main event.[47]

Another common problem was failure to plan adequately for resupply and casualty and vehicle evacuation. Logistical techniques and procedures learned at home station for maintenance and refueling of vehicles, resupply of ammunition, and the provisioning of food, water, and other essential items often did not apply in the vast terrain of Fort Irwin. Combat units fighting on the front were soon crippled without proper combat service support. When resupply did come, it often took all night, and exhaustion took its toll the next day. By the close of 1984, a relatively new technique to make resupply work was in use by some units. Under this concept, called "logistics packages" or LOGPACS, the gathering and movement forward of supplies was centralized at battalion level. Supplies were brought to a forward pickup point called a "logistics release point" and picked up there by each company team's first sergeant. The employment of a single resupply convoy, under battalion control, limited the loss of vehicles and the risk of running into obstacles or giving away the position of the Blue Force. The system was proving far superior to a decentralized system in which each team gathered its own supplies and transported them forward.[48]

---

46 Word, "Observations," pp. 12-13.

47 (1)Maj Vernon W. Humphrey, "Winning at the NTC: Reconnaissance," *Infantry* (Jan-Feb 1984) pp. 35-36. (2) Memo AFZJ-CG, Brig Gen Edwin S. Leland to Lt Gen RisCassi, 20 Nov 85, subj: NTC Observations.

48 Combined Arms Training Notes, "Good Planning Pays Off," *Army Trainer*, Winter 1984, p. 29; "LOGPACS," *Army Trainer*, Spring 1985, pp. 30-33.

Veterans of the NTC often mentioned the difficulties their units had in the breaching of obstacles on the battlefield. Although most combined arms task forces had engineer units attached, seldom were there enough engineers, and units often became stranded, their mobility reduced to zero. In this situation the unit was vulnerable to the antitank and artillery fire the OPFOR employed so effectively to cover their barriers. Training analysts suggested that all elements of the task force—not just the engineers—be trained in the breaching of minefields, wire barriers, and antitank ditches.[49]

Perhaps the two things soldiers remarked upon most frequently in assessing their NTC experience were the essential need for teamwork, and quality leadership. Teamwork was seen as the only way to survive. The NTC experience gave soldiers a better idea of how a task force worked together toward a common mission. With regard to leadership, the company commander of the 2d Battalion, 34th Infantry, which trained at the NTC early in 1983, summed it up:

> *Probably the most important lesson learned at Irwin is that leadership provides the critical variable, despite the wealth of sophisticated, lethal weaponry that surrounds the modern soldier. The nature of battle has changed so much, yet the nature of man has altered so little. The NTC proves time and again that one man can make a difference and that a few trained men can sway an engagement.*[50]

Brig. Gen. Edwin S. Leland, Jr. who succeeded Brig. Gen. Cole as NTC commander in June 1984, also pointed to the importance of good leadership. Observing that "a few skilled infantrymen are the difference between winning and losing a battalion/brigade level battle," he continued: "Our soldiers will do far more than we have any right to ask if they understand the importance of their actions, know that their leaders are competent and that they care about them as individuals, and believe that there is something special about their unit."[51]

Commanders in the field and those at headquarters generally understood that principle well. However, NTC officials, training developers, and training analysts were disturbed at the frequency with which poor command and control and the faulty application of doctrine led to the defeat of the Blue Forces. Observer-controllers and training analysts identified some specific problems. Coordination among the chain of command and between units was often poor. Too frequently, commanders failed to plan adequately and to include consideration of the mission, the enemy, the terrain, the weather, troop strength, and the time available to complete the mission. Improper placement of the tactical operations center or the command group could lead to a lack of accessibility and the sacrifice of communications. Company commanders often failed to give high priority to timely, accurate, and concise reporting of battlefield action. The battalion task force could not succeed on the AirLand battlefield in the face of those failures in command and control. For that reason, the Army's senior

49 Fetig, Maj James, "NTC Tips," *Army Trainer* (Winter 1982), pp. 18-20.
50 Bolger, Preface to *Dragons*, p. ix.
51 Memo ATZJ-CG, Brig Gen Leland to Lt Gen RisCassi, 20 Nov 85, subj: NTC Observations, pp. 1,3.

trainers increasingly insisted that training in leadership—in command and control—not be neglected at home station. As Brig. Gen. Leland summed it up:

> *The soldiers [sic] performance during NTC training is a reflection of national strength. He has shown continuously the ability to overcome the harsh environment and to perform as we expect him to. There is no limit to his stamina and endurance. The myth concerning the inability of the soldier to operate in severe heat for extended periods of time in protective equipment has been destroyed. The soldier has responded to the threat of the enemy, terrain, heat, cold, lack of sleep, and training stress unfailingly. Where a soldier fails to perform, leadership is at fault.*[52]

52 (1) Strescino, "Swapping Swamp for Desert," p. 29. Maj Harvey A. Teston, Jr., "Command and Control at the NTC," *Military Review*, Nov 1985, pp. 56-64. (3)"Combined Arms Training Notes," *Army Trainer*, Fall 1982, pp. 30-33. (4) Memo ATZJ-CG, Brig Gen Leland to Lt Gen Riscassi, 20 Nov 85, subj: NTC Observations (quotations, pp. 1, 3. (5) 2d block quotation from msg, Cdr National Training Center and Fort Irwin to Cdr TRADOC, 022200Z Jul 84, subj: Training Observations.

A close-up of the dreaded OPFOR in their "T-72 main battle tank." Note the MILES sensor belt around the turret. Trained in Soviet tactics and employing equipment and uniforms visually representative of the threat, the OPFOR was seldom beaten in battle.

An OPFOR UH-1H utility helicopter, visually modified to represent a Soviet Mi-24 HIND attack helicopter, prepares to engage U.S. Army battalion task force units with aerial-delivered rocket, cannon, and antitank missile fires.

BEST COPY AVAILABLE

The OPFOR motorized rifle regiment poised for combat, mounted in their visually modified BMP's and T-72 tanks. They could break all but the most disciplined defense by their sheer massed combat power.

An OPFOR crew, recognizable by their black berets, ready their modified M60 machine gun to defend against the approaching armored force.

As dawn breaks over the Mojave Desert, the OPFOR Motorized Rifle Regiment mounted on M551 Sheridan light tanks visually modified to resemble T-72s and BMP fighting vehicles, moves to engage a U.S. armored battalion task force.

A BMP moves out to engage U.S. Army armored forces. The BMP's 73-mm. smoothbore cannon and SAGGER antitank missile were particularly lethal against mechanized infantry.

A close-up of an OPFOR T-72 Main Battle Tank crew, mounted in their visually modified M551 Sheridan Light Tank, receives instructions over the radio to attack U.S. Army armored units.

An OPFOR medical corpsman. The OPFOR's dark uniforms set them apart visually and psychologically from U.S. Army soldiers training at the NTC.

An M551 Sheridan Light Tank, visually modified to represent an OPFOR BMP Fighting Vehicle, fires a 73-mm. smooth bore cannon at U.S. forces, while its SAGGER antitank missile is readied to attack the next target. The real BMP was a smaller vehicle with a lower silhouette.

An OPFOR BMP in hull defilade for protection from U.S. Army observation and direct fire is poised for its next mission.

Awaiting the next mission, two OPFOR soldiers, in their distinctive dark green uniforms with Soviet-style insignia, discuss the outcome of the previous mission.

With Fort Irwin's rugged mountains in the background, an M551 Sheridan Light Tank modified to resemble a BMP, moves against the U.S. Army mechanized battalion task force. Note the mock-up antitank mines in the foreground.

OPFOR soldiers await their next battle from atop the M551 Sheridan Light Tank modified to resemble a Soviet BMP Fighting Vehicle. The laser sensor belt and the strobe light that signals a "kill" are clearly visible.

OPFOR antitank ditches and concertina wire are only two of the obstacles that could canalize U.S. Army armored units should they move into "kill zones."

An M551 Sheridan Light Tank is visually modified to resemble a Soviet T-72 main battle tank. These VISMOD vehicles, used by the OPFOR, added realism to maneuvers.

OPFOR officers attend an after action review (AAR) for a unit they have just fought in mock armored combat. The AAR gives the U.S. Army unit commander and key personnel doctrinal and training performance information on the unit's strengths and weaknesses during battle.

BEST COPY AVAILABLE

Chapter VII

DATA ANALYSIS AND LESSONS LEARNED

The IDF [Israeli Defense Force] has an admirable ability and systematic approach to learning from its mistakes. The errors of the 1973 war have been carefully analyzed, and major reforms have been implemented. This is the one activity where the US Armed Forces has the most to learn from the IDF. Some IDF techniques, tactics, and materiel innovations are transferable, but most of these have been derived from a novel system that collects information, identifies deficiencies, and institutes change. It is the system and not its products that should draw American interest.

—Colonel Rod Paschall, Director
USA Military History Institute[1]

The Early Difficulties of NTC Lesson Learning

The NTC Development Plan of April 1979 made clear that one of the principal goals of the training center was the enhancement of combat effectiveness through improvements in training at home station following an NTC rotation. The primary vehicles for identification of the "lessons learned" by a task force during force-on-force and live-fire exercises would be the data generated by the instrumentation system and the information generated or gathered by human observers. The plan also made clear that the information thus made available would be used to improve training techniques, doctrine, organization, and equipment effectiveness throughout the Army. Of special

1 Col Paschall's observations on the effectiveness of the IDF lessons learned system appear as Appendix D-3 to Dennis J. Vetock, *Lessons Learned: A History of US Army Lesson Learning* (Carlisle Barracks, Pa: U.S. Army Military History Institute, 1986), pp. 163-64. His comments are included in his report of an ex-officio visit to the IDF, 29 May - 15 Jun 86.

concern to many senior Army officials was the translation of lessons learned into better training methods and programs of instruction in the TRADOC Army schools. The development plan consequently set forth in some detail the procedures for conducting the after action reviews and for assembling the take home packages that were designed to identify training deficiencies and to guide rotating units in improving their training programs after returning to garrison. The plan did not, however, define procedures for data analysis or for the establishment of a lessons learned system. Nor did it discuss methodologies for the application of lessons learned Armywide. At the same time, NTC planners and developers were keenly aware that the data generated and collected at the NTC represented a powerful research base and that it was the only capability of its type in the world. If used effectively, the NTC data would not only produce better trained soldiers but would allow the Army to exploit high technology to its fullest. However, despite widespread recognition of the NTC's enormous potential, fulfilling the mission of deriving lessons learned and distributing them throughout the Army proved much more difficult and elusive than anyone had envisioned.[2]

As the NTC matured into an invaluable training facility for rotating units, it became increasingly obvious at the same time that in too many cases the hoped for lesson learning was not taking place. And to the extent that lessons were being derived from the unit performances, they were not being distributed to potential users Armywide. Analysts noticed that all too often the same mistakes were being repeated during each rotation, sometimes by units experiencing their second rotation. In addition to the benefits the NTC seemed to offer for better training throughout the Army, top level NTC supporters had political reasons for being anxious that the NTC live up to its billing as a source of lessons learned. Critics of the training center, both military and civilian, continued to question whether the Army was getting the most for its money at the NTC. After all, the instrumentation system had cost $7.6 million and the cost of each rotation continued to rise until in 1984 it reached more than $6 million.[3]

One important source for the skepticism was the fact that units in the modern Army did not stay together for very long and often a unit was artificially kept together just for the NTC battles. As Capt. Daniel P. Bolger observed in his study of his unit's training at Fort Irwin in 1983, "[that unit] self-destructs shortly after returning to home station with the laurels of victory (or the mark of defeat) still fresh on the unit colors." While the NTC experience was not lost to the Army, it was undeniable that units often rapidly became less combat ready soon after returning from the NTC. The personnel changed, and in time the take home package was put on the shelf, while commanders moved on to other challenges. The situation was serious enough to cause some in the training community to

---

2 (1) NTC Development Plan, Apr 79, pp. II-13, III-1 to III-5. (2) TRADOC Historical Review, 1 Oct 83 - 31 Dec 86, p. 21. (3) General William R. Richardson, CG TRADOC, Remarks to TRADOC Commanders' Conference, 26 Nov - 1 Dec 83, and MFR ATCG, General Richardson, 7 Feb 84, subj: Visit to the National Training Center, Richardson Papers.

3 United States General Accounting Office, Report to the Secretary of the Army, *Army Training: National Training Center's Potential Has Not been Realized*, 23 Jul 86. The cost figures given do not include the costs of maintenance and operation which totaled $61.8 million in FY 1983 and rose to $90.3 million in FY 1985.

question whether the effects of training at the NTC were not more individual than collective. Again, Capt. Bolger put it succinctly:

> *By bits and pieces, almost as soon as the aircraft carrying the battalion back to Georgia touched down, the teams and squads and crews began to fragment as soldiers and sergeants left for Germany, Korea, Panama, other stateside units, or civilian life. The departing men carried the NTC training with them and were, no doubt, better soldiers for having been there. Still, the Dragons a year after Irwin were a totally different unit. The only traces of Irwin were written reports, word of mouth and fading memories of the few officers, sergeants, and troops who had participated in NTC Rotation 1-83.*

In order to get the most from the Army's investment in the NTC, what was critical was some means to collect, analyze, and process the lessons learned and make them a part of the Army's "institutional memory." That need became even more urgent in May 1983 when Congress requested the General Accounting Office to examine the NTC to determine if the center was living up to its advance billing. The resulting investigation, as could be expected, caused Lt. Gen. Fred K. Mahaffey, Deputy Chief of Staff for Operations and Plans on the Army Staff, to insist that NTC officials find a way to make the results of NTC training more tangible and visible.[4]

The issue of how best to extract and distribute lessons learned from combat events did not originate with the establishment of the NTC. The Army had always been concerned with the assessment of what had gone well or badly during battles and campaigns for the purpose of improved performance in the future. During the 18th and 19th centuries, lessons learned usually took the form of battle reporting which served largely as a situation update and an assessment of the performance of subordinates under fire. In the early 1900s, the newly formed service schools and professional associations began to discuss and examine combat related ideas and experiences in their journals, thereby increasing the audience for such information. World War I brought the first attempts to establish lessons learned as a system. At General Pershing's American Expeditionary Force (AEF) headquarters in France, a program of combat lessons was installed to improve as rapidly as possible the combat effectiveness of hastily mobilized units. World War II further institutionalized and centralized the lessons learned process when Army regulations made command battle reports mandatory. The new regulations also required the reports to be sent to the War Department and to the Army service schools. During the war the War Department also provided combat observers. The command reports and observer reports provided a Department of the Army level analysis group with the materials to publish a variety of information which might allow units to capitalize on the previous

4 (1) Richard W. Stewart, "Analyzing the CTC Experience," paper delivered to TRADOC Historians' Conference, January 1990, p. 3 (1st quotation). (2) Bolger, *Dragons*, p. 314 (2d quotation). (3) MFR, General William R. Richardson, TRADOC Cdr, 28 Jun 84, subj: Discussions with Lt Gen Mahaffey. (4)Word, "NTC Observations," p. 30.

experience of other units. The reports were also designed to provide the service schools with the information necessary to make changes in doctrine.[5]

The Korean War basically saw the continuation of the command report-observer combination. During that conflict, Special Regulation 525-85-5, Processing of Combat Information, officially established a lessons learned system. In addition, a number of publications disseminated combat information and extracts from battle reports to the field. During the Vietnam era, operations research methodology and the resources of the research and development community were brought to bear on the lessons learned process. The establishment of the Combat Developments Command (CDC) as part of the 1962-63 reorganization of the Army, brought together all the elements of operational development, including formulation of doctrine and the projection of future needs. The Combat Development Command's (CDC) Combat Developments Experimentation Center (CDEC) functioned as a field laboratory concerned with acting out the problems of future warfare. It should be noted that in each of the aforementioned wars, the system for capturing and disseminating lessons came into being only after the United States was already involved in the conflict and largely disappeared when the war was over. NTC planners and developers, however, hoped that the mock combat at the NTC could contribute greatly to a system that would be in place for the first battle of the next war and provide an ongoing source of raw material for assessment of the Army's status and needs, strengths and weaknesses. Thus, while the institutionalization of lessons learned was not new to the Army, the NTC with its OPFOR, realistic battlefield environment, electronic warfare, combined arms weaponry, and sophisticated data gathering instrumentation seemed to provide the best opportunity to date for the derivation and distribution of lessons learned.[6]

As the primary agency responsible for the management of change in the Army, TRADOC began in October 1981 — two months before the first battalions began training against an OPFOR at the NTC — to establish a framework for using the training center experiences. The approach was to identify the need for change and insure that the doctrinal, tactical, and training information that emerged from the NTC was made available to the entire Army. TRADOC sought to accomplish that goal through the "capturing, processing, and disseminating [of] applicable doctrinal lessons, innovations, and concepts." At that time, Brig. Gen. Frederick J. Brown III, TRADOC Deputy Chief of Staff for Training, responding to a Department of the Army directive for "a coordinated exchange of lessons learned" by commanders at all levels, designated the Combined Arms Center as the lead

---

5 Col John W. Norris, "Lesson Learning—The Army System," U.S. Army War College Military Studies Program, Carlisle Barracks, Pa., 16 Jan 90, pp. 1-2. For a more detailed and analytical treatment of the history of the Army's lessons learned system, see Dennis J. Vetock, *Lessons Learned: A History of US Army Lesson Learning*, (Carlisle Barracks, Pa.: U. S. Army Military History Institute, 1986.

6 Col John W. Norris, "Lesson Learning," pp. 2-3.

agency in that mission. CAC, in turn, delegated that authority to the NTC Division of the Command and General Staff College's Unit Training Support Directorate. Specifically, the NTC Division was to serve as the Army's repository of NTC data and observations, analyze that information in order to identify training deficiencies, and develop and publish the lessons learned for the benefit of the total Army. Responsibility for NTC data analysis and the distribution of the resulting lessons remained with the CGSC until the provisional establishment of the Combined Arms Training Activity (CATA) on 1 July 1984. At that time, the NTC lessons learned program became the responsibility of CATA's Combined Arms Integration and Standardization Directorate. NTC data was also stored at the U.S. Army Research Institute for the Behavioral and Social Sciences' (ARI) Presidio of Monterey Field Unit.[7]

The sources of NTC data and the data gathering techniques have been discussed in some detail in previous chapters. To summarize here, data generated at the NTC came primarily from two general sources. First, it was provided by the electronic sensing and measuring instruments that recorded unit maneuvers and weapons effects and stored that information on computer tapes. The automatically instrumented data provided information on position location, weapons firing, and hit-kill ratios. The electronically processed data was replayed during after action reviews and included as part of the take home packages for replay at home station. Duplicates of the THP for each rotating unit were stored at CAC. Also recorded electronically but not transmitted to the computer system were the video tapes of battle segments and of task-force level AARs and radio communications tapes. The second source was data gathered non-electronically. Such data included more traditional combat-produced documents such as the training scenarios, operations orders, staff journals, trip reports produced by subject matter experts from the TRADOC schools, and the notes taken during maneuvers by the OCs, the OPFOR, and the training analysts. In addition, there were the "NTC Observations" written by the Chief of the TRADOC Operations Group and distributed either by the Director of Training at FORSCOM or the NTC commander. The publication was based on the observations of the training analysts and the OCs across a span of several unit rotations and usually covered a six-month period. The NTC Observations were organized to address the seven battlefield operating systems and their subsets. No units or organizations were identified, but positive and negative performances were. The Observations were specifically designed to highlight systemic deficiencies, not isolated cases of unsatisfactory performance. Because disclosure of information in the "NTC Observations" was intended only to improve the readiness of the force — not to grade the performance of any unit or commander — their contents were considered privileged information.[8]

---

7 (1) Webster, "Lessons Learned," pp. 36, 43-44, 48, 50. (2) Msg, HQDA to distr, 051951Z Oct 81, subj: NTC Training and Lessons Learned (1st and 2d quotations). Brig Gen Brown was promoted to Maj Gen several months after becoming TRADOC DCST. (3) Msg, Cdr TRADOC to Cdr CAC, 141030Z Oct 81, subj: NTC Training and Lessons Learned. (4) CAC Annual Historical Review, 1986, p. 117. In August 1985, proponency for the NTC lessons learned system was transferred to the newly established Center for Army Lessons Learned, or CALL, which was a directorate under CATA.

8 (1) Shackelford, "NTC Perspectives," pp. IX-1 to IX-2. (2) Stewart, "CTC Experience," pp. 5-6. (3) Levine, et al, "Analytical Plan," pp. 6-10.

The Question of Reliability

From the beginning, problems developed with the collection of data, a situation that, in turn, raised questions about its reliability and use. Studies by ARI and other research agencies concluded that some data gathered at the NTC often did not accurately portray the battlefield and that those "data gaps" directly affected the validity of data analysis. A number of factors could cause skewed data. Among them were noninstrumented vehicles, weapons, or personnel; equipment failure; and "terrain masking" of instrumented vehicles. Noninstrumented players could not be "killed" nor could they kill other players lacking laser sensors. On the other hand, MILES-equipped vehicles designated as killed often continued to move, shoot, and kill. Or an infantry squad in an armored personnel carrier killed by a tank could exit the vehicle and continue to fight in the battle when in reality all or some would have become casualties. Such "MILES cheating" tended to greatly inflate kill ratios and to distort firing statistics. In addition, troops who trained with MILES regularly such as the OPFOR, were accustomed to it and often developed some tricks to get the most out of their lasers. Such tricks had nothing to do with real combat. In any case, casualty data was too often compromised when the MILES did not function accurately on a dusty and smoke-filled battlefield. Multiple kills also tended to compromise the data. If, for example, a noninstrumented Sagger missile — used by the OPFOR — were killed many times but not recorded as such, a lower probability of kill would be produced against Sagger systems. Meanwhile, kills that the Sagger made were recorded as "unattributable."[9]

Other major problems with data collection during maneuvers at Fort Irwin had to do with "pairing" of the killer weapon to the vehicle killed and the validity of firing summaries produced through the instrumentation system. The MILES employed a "kill code" to aid in the identification of killer and victim. The kill code was transmitted to the training analysis and feedback (TAF) facility via the core instrumentation subsystem. However, should the pairing system fail to function properly or to pick up the signal of one of the "pair", the data were not easily retrieved and were not used further for training analysis. Senior OC, Col. Word, lamented in retrospect that because of such software problems, the NTC was "only batting thirty to forty percent on firing vectors," which were the visual representation of a kill shot. Other members of the Operations Group placed the success rate of pairing shooter to target at about 60 percent. Displays of firing summaries, when matched with the graphic history of a battle, gave great promise of insights into the application of combat power. Unfortunately, the data displayed in the summaries were usually ruled invalid when that data failed to support the actual events portrayed in the video tapes.[10]

---

9 (1) Telephone Interview with James Banks, Ph.D., NTC Team Chief, ARI, Jul 1989. (2) Information Trip Report, subj: Evaluation of the Fidelity of the National Training Center Instrumentation System, Unit Training Directorate, CATA, 30 Aug 84, as cited in Simpson, et al, "Critique," pp. 6, 48; Appendix B, p. 2. "Terrain masking" refers to the loss of signal which could occur when a vehicle was hidden in a ditch or obscured by other obstacles. When the signal was interfered with, the vehicle as well as its actions was lost to instrument tracking. Probability of kill was assessed by the division of number of kills by number of weapons firings.

10 (1) Levine, et al, "Analytical Plan, p. 7. (2) Word, "NTC Observations," p.47. (3) Shackelford, "NTC Perspectives," p. V-14. (4) Goldsmith, "Fratricide," p. 5.

Other factors that acted to compromise the value of NTC statistics were the lack of objective data for assessing the effectiveness of logistical operations, and the effects obstacles had on maneuvers. Despite the importance of logistics, reporting of the flow of all classes of supply, battlefield recovery of vehicles and casualties, and personnel replacement were all left to the judgment of the OCs. Likewise, information on the location of obstacles and their effect on the movements of units was fed into the instrumentation system by controllers. The same situation existed for engineering and intelligence activities. The NTC also lacked a system to integrate audio and video records. As the NTC approached the end of its first three years of formal operations, no means existed to link tapes of radio communications with their corresponding video tapes. As for the tapes themselves, those parts of the engagements that took place after dark could not be recorded. Collecuon of information from radio networks was often made difficult when trainees used unit jargon and nonstandard procedures.

Perhaps the most serious training deficiency that remained unresolved was the lack of simulation and instrumentation of indirect fire, a problem we have noted in detail earlier. NTC developers had envisioned a facility where all the elements of combined arms warfare could come together to provide the most realistic battlefield environment possible. Fully cognizant of the dependence placed on artillery by both Soviet and American forces, the U.S. Army research and development community had struggled for years with the problem of simulating indirect fire. Yet there remained no adequate, safe, and cost-effective means of simulating or measuring the effects of artillery and mortar fire on soldiers or their equipment. The necessity for fire marker teams to assess casualties subjectively made data gathering very difficult. In addition, troops could spot the teams coming and hurry away from the target area so as not to be counted as casualties, something that would be hard to do with incoming artillery shells.[11]

The traditional paper sources of data on combat action also presented some problems for training analysts. Staff journals, operational orders, and other unit records and reports were given to the OCs for use in preparing after action reports and then saved. Like the records of units in real combat, however, those sources varied in content widely from unit to unit. Some units kept meticulous records and planning documents. Others made do with handwritten notes—employing no standardized format and scribbled on pieces of paper of varying sizes—and on voluminous radio traffic. During each rotation, a different set of material was preserved and with varying degrees of completeness. To be sure, it probably would have been asking too much to expect task force sized units to keep complete and standardized records while trying to fight off hundreds of OPFOR vehicles. While paper documents proved useful in the analysis of combat actions, their recording of processes was too erratic to form a broad data base. There was also the problem of information that never made it to paper. One researcher lamented that it was hard to recover notes made with a "grease pencil on a map cover on the hood of a jeep" or "on the top of [an] ammo can." However, with regard to any

11 (1) Simpson, et al, "Critique," pp. 2-6, 24-25, 51. (2) Bolger, *Dragons*, pp. 151-52.

distortions in the data gathered at the NTC, it was also true that the distortions were more of a concern for exercise controllers and analysts looking for precision than they were for the soldiers in the training units. They, after all, could still react to combat situations and other troop units as though there were no instrumentation.[12]

Dissemination of Lessons Learned

In addition to the difficulties in the collection and analysis of NTC data, problems also continued with the use of available information. In the early 1980s, the basis for collective tactical training and evaluation in the Army was the Army Training and Evaluation Program, known to all soldiers as the ARTEP. However, at the NTC, observer-controllers used the framework of the seven battlefield operating systems within which the resources of a battalion task force were organized, to evaluate training. Within that framework, the OCs analyzed the execution, control, coordination, support, and planning activities of the task force. In short, the data analysis system at the NTC was not designed around the Army's major training and evaluation tool — the ARTEP. That situation meant that units trained in advance of a trip to the NTC with an evaluation system different from what they would encounter there. It also meant that the take-home packages provided to each unit could not readily be related to the ARTEP tasks it trained on after return to home station. Developers of the NTC evaluation concept apparently had believed that the complex missions designed for a battalion task force could not readily be broken down to the task-subtask format of the ARTEP. While this dichotomy concerned many in the training development community, others strongly defended use of the seven battlefield operating systems as a basis for NTC training evaluation. In addition, units attempting to correct at home station the training deficiencies identified at the NTC, often encountered another difficulty. Many did not have the special computers and monitors required for playback of the digital tapes of their maneuvers which were included in the take-home packages.[13]

Even assuming that most of the data generated at the NTC, both objective and subjective, was collected and ruled valid, problems still existed in 1984 in the analysis of the data and in dissemination to the field. First, no method existed for integrating the various forms of data, either quantifiable or subjective, into one data base for analysis. Even the readily available data included in the take home packages was of limited utility for analytical purposes because it briefly summarized very wide ranging types of information. Second, despite early efforts to do so, described above, TRADOC failed to define or develop a workable system to capitalize on the NTC experience in support of better institutional and unit training throughout the Army. That is not to say that no effort was made to provide FORSCOM units and the TRADOC schools the benefits of the experiences of units training at the NTC. Shortly after the NTC opened, training analysts at CAC began publishing *Combined Arms Training Tips* for the battalion task force commander and his staff. CAC distributed the pamphlet to every maneuver battalion in the Army. Articles dealing with problems at the company, platoon, and squad levels were published quarterly in the Army Training Support Center's *Army*

12 (1) Stewart, CTC, p. 12. (2) Pence, Leader Performance, p. 13 (quotation).
13 Simpson, et al, "Critique," pp. 43, 45, 53.

Trainer magazine. Other lessons learned were written into new drafts of FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, and other how-to-fight manuals. For use by units in OPFOR training at home station, the Opposing Force Training Detachment at Fort Hood published and distributed a periodic pamphlet entitled Red Thrust. Members of the NTC Division staff also wrote articles for publication in professional military journals and bulletins, and presented briefings and workshops at Army schools and centers. Despite such worthwhile efforts, in 1984 the analysis of NTC data and the dissemination of lessons learned to the field left much to be desired.[14]

If the NTC was to fully recognize its potential as the pinnacle of the Army's collective training system, the necessity existed to train not only battalion task forces but other elements in the Army. Beginning in the summer of 1982, the TRADOC service school commandants began to send subject matter experts (SME) from their own faculties to observe the force-on-force maneuvers. The impetus for the SME Program, which CAC controlled, was the recognition that instructors and doctrine writers were junior officers with relatively little tactical experience. That situation meant that most future service school students having experienced NTC training would possess greater experience than the officers responsible for their professional development. It was hoped that the SME Program would provide doctrine writers with deeper insight into how doctrine translated into actual practice and would enable instructors to better relate task force combat experiences to their students. The program also had the potential of providing and sustaining the expertise of the NTC trainer force through exposure to those who were writing the doctrine that drove training. At the training center, SMEs were matched with OCs who shared the same areas of interest and accompanied them during a rotation.[15]

Another TRADOC-sponsored program allowed officers designated for battalion and brigade command to observe training at the NTC with the OCs. Immediately following the Fort Leavenworth phase of the Precommand Course, those officers traveled to Fort Irwin to see the instruction they had received in the classroom in practice on the instrumented battlefield. The program was designed to teach task force combined arms operations, acquaint the students with Soviet tactics through observation of the OPFOR in action, and acquaint them with the NTC methodology so that its applicable features could be adapted to the training programs of their units.[16]

A third program, termed the Senior Leader Training Program, was instituted at the direction of FORSCOM commander, General Richard E. Cavazos and provided a tutorial by the division chain of command to FORSCOM leaders in both the active and reserve components. Leaders spent three days at Fort Irwin conducting a tactical exercise without troops, led by the division commander or his assistant division commander for maneuver. Participants discussed the doctrinal soundness of the plans and orders of task forces undergoing training and observed the execution of the operations. In

14 (1) Whitmarsh, "Overview," pp. 9-11. (2) Memo, ATTG-ZX, TRADOC DCST to CofS, 29 May 85, subj: DCST Significant Activities. (3) Levine, et al, "Analytical Plan," p. 6.

15 Shackelford, "NTC Perspectives," pp.X-1 to X-2.

16 Ibid., p. X-2.

the program's own version of the AAR, the students discussed the battles and expressed their own opinions on the execution of the mission.[17]

Toward a More Responsive System

Thus recognizing that the NTC offered the Army's best training for combat troops, senior Army officials and training analysts at CAC in the early 1980s were anxious that the lessons learned at the NTC be applied at all levels in the field as rapidly and completely as possible. However, despite programs aimed at platoon through division levels, TRADOC still seemed unable to develop an integrated lessons learned system or an efficient and effective methodology for deriving lessons from the data generated by rotating units. By the summer of 1983, the deficiencies were well known and freely acknowledged in NTC circles. In short, the Army was not deriving all it could from the NTC experience. Although TRADOC Regulation 11-7, Operational Concepts and Army Doctrine, established procedures for developing new concepts and converting them into Army doctrine and training programs, no clear guidance existed for plugging the NTC into the equation. As the data base grew and timely responses to training deficiencies failed to materialize, training developers at the Department of the Army and at TRADOC grew increasingly concerned. Although a recognition that the Army lacked an efficient system for translating lessons learned into improvements in doctrine, organization, materiel development, and training was certainly not new, the situation at the NTC served to bring that fact home dramatically. Beginning in mid-1983, the idea of a lessons learned system for the Army received increasing attention at the highest levels.[18]

As noted earlier, in the NTC Development Plan of 1979, the Army had recognized that developing lessons learned was to be an important aspect of the NTC and that unit performance needed to be measured against a set of qualitative and quantitative standards. The plan set June 1981 as the "milestone" for that action. However, when the NTC opened in July 1981, neither of those issues had been formally addressed. In October of that year, the Department of the Army told TRADOC to ". . . take the lead in establishing responsibilities and procedures for capturing, processing, and disseminating applicable doctrinal lessons, innovations, and concepts." In passing that responsibility to CAC, Brig. Gen. Frederic J. Brown III, then Deputy Chief of Staff for Training at TRADOC headquarters, directed that the lessons learned mission be defined and a plan conceived for using information gathered at Fort Irwin in such a manner as to "lead to changes in doctrine or operational concerns." He recommended that a working group made up of representatives from TRADOC's major subordinate elements be established to define responsibilities and procedures for a lessons learned system. No such group was ever established.[19]

---

17 Ibid., p. X-3.

18 Webster, "Lessons Learned," pp. 62-63.

19 (1) Webster, "Lessons Learned," pp. 61-63. (2) Msg, HQDA to Cdr TRADOC, 051951Z Oct 81, subj: NTC Training and Doctrine (1st quotation). (3)Msg, Cdr TRADOC to Cdr CAC, 141030Z Oct 81, subj: NTC Training and Lessons Learned (2d quotation).

There the matter apparently stood for quite some time while the NTC concentrated on ironing out the training problems associated with the instrumentation system, equipment, and other matters. Then in May 1983, the subject surfaced again during a meeting of representatives of branch proponent schools, the Director of Training for FORSCOM, and the deputy commandant of the Command and General Staff College at Fort Leavenworth. Maj. Gen. Brown, at that time commandant of the Armor School, acknowledged that the primary focus of the NTC should be training, but he again insisted that "we need to review our system of analyzing, editing, and refining the lessons learned from unit experience." Maj. Gen Crosbie E. Saint, Deputy Commandant of the CGSC, agreed. From the CGSC standpoint as the TRADOC executive agent for the NTC, what was needed was a "system to respond to requests [for guidance] from the NTC without having to ask each school every time." The conference participants clearly recognized that a need existed for some sort of structure that would allow the Army to capitalize on NTC records for the good of the entire Army. They did not, however, make any concrete recommendations or suggestions. Again training issues took precedence over the derivation and dissemination of lessons learned. However, in that same month, a call from Congress for the General Accounting Office (GAO) to investigate the NTC to determine if the government was getting its money's worth, brought greater pressure to bear on the lessons learned issue.[20]

The impetus for the GAO action came from Congressman Joseph P. Addabbo, a Democrat from Queens, New York, who was often a severe critic of the Pentagon. Addabbo was also Chairman of the Defense Subcommittee of the House of Representatives Appropriations Committee. Apparently, the congressman's concern grew from the second issue of "NTC Observations," which was issued inside the Army in late 1982. That analysis, written by the NTC commander, detailed systemic failings in the performance of FORSCOM units at the NTC. Approximately a month later, the flames the congressional request for a GAO survey had ignited were fanned when the *Army Times* acquired a copy of the "NTC Observations" through the Freedom of Information Act and summarized

20 (1) Memo ATZL-SWU-N, CGSC, 17 Jun 83, subj: Reporting on NTC Visits (both quotations). (2) Webster, "Lessons Learned," pp. 65-66.

FORSCOM's findings. The national press rapidly spread the word that the Army lacked "go to war" skills. The *San Bernardino Sun* proclaimed that "American troops performed poorly over two years of desert war games in California and were easily defeated by mock Soviet forces." The bad press increased congressional concerns and GAO activity. It also left deep scars at Fort McPherson, FORSCOM headquarters, which henceforth would prove highly sensitive to official publication of NTC data or indeed of any derogatory comments on the performance of FORSCOM units. Perhaps anticipating the negative results of the GAO efforts, activity aimed at the establishment of a lessons learned system increased during the last half of 1983.[21]

In September, CAC commander Lt. Gen. Carl E. Vuono sent a message to Brig. Gen. Thomas F. Cole, the NTC commander, to once again outline the TRADOC and FORSCOM responsibilities at the NTC. In that message, he stressed that the results of NTC training "must be recorded, evaluated, and fed back into the doctrine and training development processes, institutional training of leaders and soldiers, and training programs conducted by units in the field." Vuono also defined CGSC responsibilities for maintenance of the data base, analysis of the data, and the "overseeing of corrective action by proponents as required." Doubtless with the bad press the "NTC Observations" had received in mind, he called for a change in their format to reflect more positive achievements:

> *What the Army needs is a take-home training package that measures the changes in unit performance of critical ARTEP tasks, identifies the factors which contributed to the improvement, and specifies the training required at home station to maintain the impetus and strengthen observed weaknesses. A six-month summary replacing the present Observations format for FORSCOM and CGSC will be required.*[22]

To make a start in achieving those ends, the NTC Division of the CGSC hosted a conference at Fort Leavenworth in late September, 1983. Representatives of TRADOC headquarters, CGSC, and

---

21 (1) CAC Annual Historical Review, 1986, pp. 99-100. The CAC historian, Dr. Rodler F. Morris, believed the first report based on "NTC Observations" appeared in the San Bernardino *Sun*, However, both Lt Gen Vuono, CAC Commander, and Col Shackelford, Chief of the TRADOC Operations Group at the NTC insist it was the *Army Times*. Telephone conversation with Col William L. Shackelford, 4 Oct 90. (2) Shackelford, "NTC Perspectives," p. IX-2. Below is a sample "Observation" provided by Col Shackelford, Chief of the NTC Operations Group, who stressed its status as an example only and not an actual training observation:
"Observation": Task forces do not conduct satisfactory reconnaissance and security operations. Enemy reconnaissance elements have little difficulty penetrating task force defenses and collecting detailed information on friendly positions, locations, and dispositions. This allows the enemy attack force to pre-plan in detail the scheme of maneuver to isolate portions of the battlefield and attack into or through known BLUFOR weaknesses in the defense. Additionally, the task forces do not acquire sufficient combat information by task force organic intelligence collection units.This results in an incomplete picture of enemy strengths, weaknesses, positions, and dispositions.
Reason: The task force S-2 and S-3 know that reconnaissance and security operations are inherent in every combat operation. The reason for weakness is determined to be a lack of coordination within the task force staff and the lack of aggressiveness of theS-2. The task force intelligence officers overall do not possess the strength to personally interact with the task force commander and do not ruthlessly drive the intelligence system.

22 All quotations taken from Msg, Cdr CAC to CDR NTC, 121530Z Sep 83, subj: NTC Training and Evaluation, quoted in Webster, "Lessons Learned," pp. 64-66.

the Armor and Infantry schools produced a "strawman" multimedia data collection plan for one ARTEP task—defend in sector—to "meet Army-wide needs for NTC feedback." After comments from the field, planners expected to use the "NTC ARTEP" as a prototype for a complete data collection plan including all eight battle scenarios by the summer of 1984. For reasons that are not entirely clear, the attempt to develop and use quantifiable standards in ARTEP tasks at the NTC were soon abandoned. NTC officials would later tell GAO investigators that the effort was stopped because of inadequate resources. Doubtless, funding difficulties exacerbated the problem of measuring training effectiveness against quantifiable standards, but a more basic problem lay in the question of how to place quantifiable values on training, experience, and readiness. How did one develop such a model? Some data was gleaned from take home packages, but the major source of information distributed as lessons learned continued to be the reports of observer-controllers and the subject matter experts from the service schools.[23]

During the last three months of 1983, with the GAO survey of the NTC still not completed, a number of other efforts were made to institutionalize a lessons learned system. On 2 October 1983, TRADOC approved a dedicated lessons learned "cell" at the Combined Arms Center, to be staffed with twenty-three personnel. Three weeks later, the Grenada intervention, and the deficiencies in readiness it exposed, made the need for a centralized lessons learned system more acutely felt. Partly in reaction to this, in November TRADOC proposed the establishment of an "NTC Feedback System," a computer system that would be dedicated to analyzing data collected by the instrumentation. That enhanced capability was expected to provide the Army the capability to extract, sort and manipulate data, which could then be made available to support institutional and unit training programs and doctrine and force development initiatives throughout the Army. The system, as planned, would also allow CAC and the Army schools direct access to the data. The Army's budget for the 1986 fiscal year contained $2.6 million for initial development of the Feedback System.[24]

Meanwhile, in a move that one could argue had more of a negative impact than a positive one on the dissemination of lessons gleaned from combat actions at Fort Irwin, FORSCOM moved to classify the "NTC Observations." Still smarting from the critical press coverage of earlier "Observations," that headquarters brought up the topic for discussion at an NTC Executive Committee Meeting

---

23 (1) TRADOC DCST Significant Activities Report, 4 Oct 83. (2) NTC Futures Concept, [1986], p. iii. (3) Comments from the Assistant Secretary of Defense, Force Management and Personnel, appended to GAO Report, 23 July 85.

24 (1) Col Richard I. Edwards, TRADOC NTC Systems Manager, Fact Sheet, TRADOC Cdrs Conference, 28 Nov - 1 Dec 83. (2) United States General Accounting Office, Report to the Secretary of the Army, *Army Training: National Training Center's Potential Has Not Been Realized*, July 1986, p. 13. The NTC lessons learned "cell" at Fort Leavenworth initially functioned as part of the Unit Training Support Directorate of the CGSC. Upon the creation of CATA in the summer of 1984, the lessons learned group became a part of the CATA Unit Training Directorate. In August 1985, the Center for Army LessonsLearned (CALL) was established as a directorate of CATA. At the same time, the NTC lessons learned team became part of the Combined Arms Integration and Standardization Directorate of CATA. In January 1986, the NTC team was absorbed into CALL. Telephone conversation with Dr. Rodler F. Morris, CAC Command Historian, 23 Sep 91.

on 18 November 1983. Shortly thereafter, the FORSCOM Deputy Chief of Staff for Operations decided that in the future no distribution would be made beyond FORSCOM and the CGSC, and that existing copies would be marked as confidential working papers. In forwarding a copy of "NTC Observations," Volume III, to TRADOC commander General William R. Richardson, CAC commander Lt. Gen. Vuono commented that he did not think the limited distribution would be a problem since the take home packages provided the same information and were forwarded to TRADOC schools. General Richardson did not agree. From the beginning, he had taken the position that all NTC operations and the information gathered from them should be unclassified to allow for a free exchange of information before, during, and after NTC rotations. FORSCOM's action with regard to the "NTC Observations" would serve to severely limit the dissemination of any lessons that might be garnered from NTC training.[25]

On 2 March 1984, the General Accounting Office presented a draft laying out its findings on the NTC. In a preliminary report to the Congress and to Secretary of the Army John O. Marsh, Jr., the GAO director noted that current investment costs for the NTC exceeded the Army's initial estimate by more than $125 million. By the end of fiscal year 1983, $262 million had been invested in the training center, which had cost $149 million to operate in that fiscal year alone. At the same time, the number of projected rotations per year had been reduced by one-third. Moreover, "possible systemic problems" had been identified. Over the next year, the GAO followed up its initial report with a careful investigation of data collection and the lessons learned at the NTC and found both severely lacking. To be sure, those in the Army training community who were responsible for the NTC program did not have access to the final GAO report until July 1986. However, certainly things in 1986 were no worse with regard to data analysis and lessons learned than they had been two years earlier. In fact, little seemed to have changed at all. In short, the contents of the final GAO report can be applied with some confidence to the situation that investigators found in 1984. The GAO certified that the Army had indeed achieved one of its two primary objectives, that of providing realistic training not available at home station. However,

> *. . . the full potential envisioned by the Army for the Center when it was established has not been realized. This is because the Army has been unable to (1) use the objective data collected for overall assessments of its organizations and weapon systems or (2) identify causes of Army wide problems demonstrated during Center exercises and initiate solutions.*[26]

According to the report, the roots of the problem at the NTC were the Army's failure to identify the types of data needed to assess unit performance over time, and the unreliability and incompleteness of the data collected through the instrumentation system. The implication was that by achieving its full potential through developing lessons learned from exercise results, the Army might defuse

---

25 Ltr, Lt Gen Vuono to General Richardson, 13 Mar 84, with Richardson's handwritten comments, Richardson Papers.

26 GAO Report, July 1986, (quotation, p. 2).

Congressional and other criticism of NTC costs. In comments on the draft version of the 1986 report, the Assistant Secretary of Defense, Force Management and Personnel, did not challenge the GAO conclusions except to point out that the regulation establishing the NTC (AR 350-50) clearly stated that the training environment would be paramount at the NTC. From the inception of the NTC, the Army had always considered data collection and analysis secondary to accomplishing training objectives.[27]

Meanwhile, a possible solution to the lessons learned dilemma had reached a dead end. In October 1984, CAC recommended that TRADOC suspend the purchase of the NTC Feedback System the command had proposed the preceding fall, to which we have already alluded. The request followed a CAC evaluation of the instrumentation data, in which CAC officials had concluded, like the GAO, that the data was of negligible analytical value because of its inaccuracies. In any case, the report continued, manual extraction and analysis of the data collected was futile and not cost effective. The criticisms in the CAC report reinforced what many NTC training analysts had already noted, and which we have earlier discussed at some length. Suffice it to say here that in most cases the instrumentation system's reporting of erroneous statistics on weapon firings and types, hits, kills, and vehicle and weapon position locations was primarily the result of the system's inability to monitor and record the activity of vehicles hidden in valleys and trenches. In the absence of data that could be used with confidence, CAC analysts hesitated to draw conclusions regarding Armywide lesson learning through trends ostensibly identified at the NTC. As the GAO report put it, "the Army has spent millions of dollars collecting information which it is reluctant to rely on for developing Army-wide lessons learned."[28]

As the Army considered the possible impact of the GAO and CAC reports and what its response should be, an effort was under way at Department of the Army level to produce a regulation establishing guidance for the "planning, programming, budgeting, and conducting appropriate action pertaining to combat and exercise lessons learned." That action, too, was clearly a response to the performance of troops in Grenada. In December 1983, the Army Studies Group began an analysis at the behest of General John A. Wickham, Jr., Chief of Staff of the Army, of the Army's ability to adapt forces to local conditions of combat. Out of that analysis grew a draft of a Department of the Army regulation entitled "Adapting for Combat - Lessons Learned," which proposed a system for capturing lessons learned. The Deputy Chief of Staff for Operations and Plans sent the draft to the field for comment in June 1984. Among other things, the proposal included TRADOC briefings to the Secretary and Chief of Staff of the Army "on key lessons learned and provisions for reprogramming

---

27 (1) Ltr, Frank C. Conahan, Director, General Accounting Office (GAO), to the Honorable Joseph P. Addabbo, Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives, 2 Mar 84, with the attached report, United States General Accounting Office Report to the Secretary of the Army, "Impact of the Army's National Training Center on Improving Individual Soldier and Unit Abilities." (2) GAO Report, 23 Jul 86, pp. 2-3. The draft version of the 1986 report was, perhaps more appropriately entitled "Need for A Lessons-Learned System At the National Training Center." Department of Defense comments are appended to the published report of July 1986.

28 Summary of CAC report of October 1984 is in GAO Report, July 1986; quotation is on pp. 16-17.

as necessary to incorporate lessons on an urgent basis." Wickham wrote in his own hand on the cover letter, "We must institutionalize the process of gleaning combat lessons learned so that our school system, our unit training, and our personal efforts at self-improvement can benefit." The draft regulation explicitly stated that "the National Training Center is considered as a key exercise requiring continuing systematic observation and analysis." The development of a methodology for implementing the lessons learned system outlined in the Army regulation fell to TRADOC. By December 1984, that concept had taken the form of the development of an Army Lessons Integration Center to be established at CAC. In August of the following year, all those efforts culminated in the establishment of the Center for Army Lessons Learned (CALL) as a directorate in the Combined Arms Training Activity at Fort Leavenworth. The $2.9 million programmed for the canceled NTC Feedback System was reprogrammed to support the development of CALL.[29]

Discussion of CALL and the establishment of its system for capturing Army lessons learned is beyond the purview of this study. It should be noted, however, that it was not until after Brig. Gen. John C. Heldstab took command of CATA late in 1985, that the Army finally began to establish a coherent system for identifying the lessons being learned at the NTC and for their application throughout the Army. Until that time, the instrumentation served primarily to support the AARs. Despite the emphasis placed from the beginning on the objective assessment of unit performance, the most valuable data collected had come from subjective sources. As for the NTC as a whole, its value had been limited in large measure to the training units. It would perhaps not be fair to say that those elements in the Army concerned with the success or failure of the NTC in its early years were not concerned with its lessons learned mission or that they half-heartedly supported solutions to the problems of data gathering and analysis. A lessons learned system for the NTC, however, was most assuredly not a top priority, especially before the Grenada intervention. In preparation for the TRADOC Commanders' Conference late in 1983, the TRADOC Deputy Chief of Staff for Training identified sixty issues he considered to be of special importance to the Army's training community. A lessons learned system was not one of them.[30]

There appear to have been a number of reasons why, during the NTC's first years of operation, only the units rotating through Fort Irwin were learning much in the way of lessons, while the evaluation of TRADOC products was almost totally eclipsed. First, there were the difficulties of launching such an innovative and previously untried venture. It took time to bring together and

---

29 (1) AR XXX-XX, Adapting for Combat—Lessons Learned (draft), Revision of 13 Jun 84, p. 1 (1st and 4th quotations). (2) Memo DACS-ZA, General Wickham to DCSOPS, 15 Jun 84, subj: Adapting for Combat—Lessons Learned (2d and 3rd quotations). (3) DF, ATDO-P, Maj Gen Harry D. Penzler, DCSDOC, HQ TRADOC, to distr, 27 Dec 84, subj: Review of the Draft Army Lessons Integration Center. (4)GAO Report, July 1986, p. 23. CALL was established officially on 1 August 1985. In addition, the Combined Arms Integration and Standardization Directorate formed a separate team known as the National Training Center Lessons Learned Team. The NTC Lessons Learned Team functioned, in effect, as a separate directorate under the CATA commander until late January 1986, when it became a part of CALL. CAC Annual Historical Review, 1986, p. 119.

30 (1) CAC Annual Historical Review, 1986, pp. 118-20. This CAC AHR contains a detailed account of the establishment of CALL and of the missions of CATA through 1986 written by Dr. Rodler F. Morris of the CAC History Office. (2) Information Booklet, TRADOC Commanders' Conference, 30 Nov - 1 Dec 83.

integrate the various NTC elements in accordance with the concept. It has been suggested that lessons learned suffered because "the commander of the NTC Operations Group [apparently] agreed with the FORSCOM inclination to subordinate everything to training the rotating units." While it is clear that the principals involved were determined that training would not take a back seat to any other function, such attitudes should perhaps be cause for tribute rather than criticism. From the beginning NTC developers had stressed that distractions to training would not be tolerated and that data collection and analysis was a secondary mission. AR 350-50, The National Training Center, which established policies and responsibilities for the NTC, clearly stated that "the training environment will be paramount at the NTC. Data analysis will be secondary to accomplishing training objectives." While NTC officials understood that the training center at Fort Irwin had never been intended as a stand-alone activity, but rather as a part of the total Army training system, their determination that training remain the primary mission was a tribute to their dedication to the NTC concept.[31]

There were other reasons the lessons learned potential of the NTC was slow to be realized. TRADOC influence was attenuated by the diffusion of NTC responsibilities within CAC that occurred between the demise of CATRADA in 1982 and the birth of CATA in 1984. That organizational hiatus robbed the command of a single, and thus more potent, voice. In addition, as the GAO report pointed out, "the Army did not develop criteria for performance measurement before purchasing the NTC data measurement system . . . ." Moreover, with regard to assessing performance, there was a lack of integration between the rotating units' ARTEP training guidance, and the seven battlefield operating systems employed at the NTC for the evaluation of unit performance. That situation complicated the correction of training deficiencies that had been identified at the NTC based on the operating systems, when training at home stations proceeded according to the ARTEP. In any case, the limitations of the NTC range instrumentation system would have imposed limits on the learning of objective lessons—even had data collection and analysis been given the highest priority and a system perfectly defined. Although technology was rapidly advancing, it often lagged behind the ambitions of NTC planners. Even so, it must be remembered that much of the data that was collected proved invaluable during after action reviews—the basic training evaluation tool at the NTC. In the last analysis, the NTC and its instrumentation system provided a greater measure of unit performance than ever before achieved.[32]

---

31 (1) CAC Annual Historical Review, 1986, p. 145, chapter written by Dr. Rodler F. Morris of the CAC History Office (1st quotation). (2) AR 350-50, The National Training Center, effective 15 April 1980 (2d quotation).

32 GAO Report, July 1986, pp 15-17.

Chapter VIII

THE UNITED STATES AIR FORCE AT THE NTC

Establishing a Program for NTC Air Support

From the beginning NTC developers had realized that if they were to create the Army's most realistic training environment for combined arms operations and depict all dimensions of the battlefield, close air support (CAS) had to be provided. Thus, they had envisioned a necessary and important role for the United States Air Force. Indeed, as noted above, the NTC had been conceived as the Army's counterpart to the Air Force's Red Flag training at Nellis Air Force Base. Beginning in November 1979, the Army—specifically, the TRADOC NTC Office—sought to negotiate a joint program with the Air Force's Tactical Air Command (TAC) that would provide for Air Force participation in the training exercises at Fort Irwin and define the Air Force role. Because TAC headquarters was located at Langley Air Force Base, Va., only a few miles from TRADOC headquarters at Fort Monroe, many of the negotiations between the two services took place in face-to-face meetings between the two commanding generals. Specifically, the Army requested that the Air Force provide the components of a tactical air control system, the personnel necessary to operate and maintain threat simulator equipment, and an average of eighty-four to ninety close air support sorties during each exercise. Originally, Army plans called for joint operations to begin with ten exercises (20 battalions) in FY 1983, to increase to twenty-one rotations (forty-two battalions) in FY 1984 and beyond. As discussed earlier, that number was later significantly reduced.[1]

The story of the evolution of joint Army and Air Force participation during the NTC's early years provides insight into a parallel chapter in Army-Air Force relations: the continuing debate about how the close air support mission should be executed in combined arms operations, as prescribed by AirLand Battle doctrine. In addition, the history of the Air Force presence at Fort Irwin throws light on the interservice rivalry often present in the conception and development of large defense projects.

---

1 History of the Tactical Air Command, Langley Air Force Base, Virginia, 1 Jan - 31 Dec 81, Vol 1, pp. 247-48 [hereafter cited as History, TAC. with appropriate date and volume] (SECRET — Information used is UNCLASSIFIED).

An examination of the experiences of both services at the NTC further reveals some of the additional problems inherent in combined arms operations on the modern battlefield.

In late December 1980, the United States Air Force Air Staff requested discussion of the issues bound up in Air Force participation in the Fort Irwin exercises. The Air Staff asked that the Army comment on several potential problems. Of particular concern to the Tactical Air Command (TAC) was airspace management, continued access to the Fort Irwin Leach Lake Gunnery Range, and the cost of Air Force support to the Army training exercises. The Leach Lake Range, a dry lakebed in the northern-most part of Fort Irwin, provided a major component of the bombing practice available to American and German aircrews operating from George, Nellis, and Edwards Air Force bases, as well as to Air National Guard units from California and Iowa. TAC considered written guarantees of unrestricted access a precondition for providing threat simulators. Early in the Army-Air Force negotiations, TAC insisted that a dedicated forward air control post be established at the NTC to control close air support assets and provide adequate separation between aircraft. That request was withdrawn when TRADOC officials provided additional information about existing facilities and procedures at Fort Irwin. As to cost, Air Force officials suggested that for the first year of the program, units that had already deployed for Red Flag, accompanied by a small number of units deployed to George Air Force Base, could provide CAS at Fort Irwin. For the long term. TAC recommended an Air Reserve Forces A-10 unit be stationed within easy flying range of the NTC. Whatever the final solution, senior Air Force officials stressed that Air Force training also had to benefit from the NTC experience if the Air Force was to gain full value for its investment there.[2]

Despite a number of initial reservations, the Tactical Air Command supported the concept of the National Training Center, which was based so heavily on its own Red Flag exercises. Consequently, in January 1981, the command established a "program review organization" (PRO) to negotiate a memorandum of understanding (MOU) with TRADOC. Two months later, General Wilbur L. Creech, the TAC commander, sent a message to the Air Staff indicating that TAC would provide close air support for the Army Blue Forces at the NTC. In addition, he recommended support for the Air Force electronic warfare array, for assisting the Army in airspace management, and for the investigation of a laser engagement system for aircraft that would be compatible with MILES. Even with that support, progress was slow. By May 1981, the TRADOC Deputy Chief of Staff for Training was already concerned that TAC support for Air Force participation in NTC exercises was eroding, especially with regard to the funding and development of an instrumentation system and the deployment of a threat electronic warfare emitter array. He attributed the perceived change in position to Air Force sensibilities about inaccurate casualty assessment and TAC's concern that commitment to the NTC might divert resources from projects TAC considered more important than Army training. General Starry, the TRADOC commander, advised that the Air Force not be pressed too hard. He suggested the Army consider using its own assets to instrument fixed wing aircraft and

2 ((1) Ibid. (2) Msg, Col Emery S. Wetzel, Asst Deputy Chief of Staff, Plans, USAF to distr, 26 Jan 81, subj: Air Force Support of Army National Training Center (NTC). (3) Staff Summary Sheet, TAC Support for the National Training Center, 27 April 1981.

hope to gain Air Force participation in engagement simulation as Army efforts showed positive results. Throughout the year-long negotiations, TAC was continuously concerned about the cost of Air Force participation which was estimated to be a total of $1,200,000 for the support of ten exercises in FY 1983 alone. By the spring of 1982 cost estimates for that fiscal year had risen to $2 million. To avoid the cost of airlift and temporary duty per diem pay for FY 1984 and beyond, TAC planners envisioned permanently positioning Tactical Air Support Center equipment and personnel at Fort Irwin.[3]

Although Twelfth Air Force began flying occasional sorties from George Air Force Base to the NTC in November 1981 just prior to the first official battalion rotation, it was not until 1 December of that year that a joint memorandum of understanding formally established Air Force responsibility for the provision of CAS, electronic warfare simulators, and the development and acquisition of laser-based engagement simulators for high performance aircraft that would be compatible with the Army's MILES. TAC was committed to flying a total of 900 sorties (90 per rotation) in support of the ten rotations to the NTC in fiscal year 1983, as well as to providing Tactical Air Control System personnel. By May 1983, TAC, FORSCOM, and TRADOC would mutually agree upon sortie levels for FY 1984 and beyond. (Eventually the two services agreed that the Air Force would support twelve exercises in FY 1984.)

Although the Air Force had originally opposed flying CAS for the OPFOR on grounds that it had "no training need for it," the final agreement between the services included both "Red Air" and "Blue Air," with each being supported by a different type of aircraft to ease identification by air defense artillery units. Normally six aircraft would support the Blue Forces, three the OPFOR, and three the airborne forward air controllers. The Tactical Air Command would also provide range measurement system pods to depict the flight paths of aircraft. That equipment would allow the Army to document air attacks in support of and against the Blue Forces and satisfy TAC requirements to extract similar data for aircrew debriefing purposes.

The aircraft to be committed included A-10s from the 354th Tactical Fighter Wing, F-16s from the 474th Tactical Fighter Wing, and Air National Guard A-7Ds and F-4Ds from a unit at March Air Force Base, Calif. Interim plans called for those aircraft to fly their missions from George Air Force Base until further studies could assess the feasibility of deploying from George on a permanent basis.

---

3 (1) Staff Summary Sheet, USAF TAC, 27 Apr 81, subj: TAC Support for the National Training Center. (2) History, TAC, 1982, pp. 238-39 (SECRET — Information used is UNCLASSIFIED). (3) Records of the Office of the Command Historian, HQ TRADOC.

A major snag in the long negotiation process was the question of who would fund the electronic warfare threat emitters. TRADOC expected TAC to assist in providing emitters because it would benefit aircrew training. TAC, on the other hand, took the position that the NTC was an Army training facility and that the Army ought to fund them. To prevent rejection of the entire MOU, a loosely worded and open ended statement of TAC "support" for the emitters was finally included. To provide command and control, until a more permanent arrangement could be made, the Air Force assigned two temporary duty officers to manage TAC operations at the NTC and to determine manpower and equipment requirements for continuing operations.[4]

By the end of February 1982, a senior Air Force representative had been permanently stationed at Fort Irwin. Lt. Col. Philip C. Davis served as the first Air Force advisor to the NTC commander and as commander of Detachment 3 of the 4525th Combat Applications Squadron. The squadron was the tactical air control element that simulated the Air Force tactical air control system chain of command from corps to division by coordinating and controlling the flow of aircraft into and out of the Fort Irwin training area. The Air Force advisor reported directly to Headquarters, TAC, Deputy Chief of Staff for Plans. His principal duties were to assist the NTC staff in planning CAS for force-on-force maneuvers as well as for Blue Forces' live air-delivered ordnance during the live-fire exercises. Detachment 3 also performed an exercise evaluation function, using roving observers, and transmitted after action reviews for each exercise. In August 1982 the Air Force established an operations base at George Air Force Base to plan for and receive temporary duty personnel, assist in arrival and redeployment of flying units, and provide maintenance support. Following establishment of an operating location and successful completion of the FY 1982 exercises, the Headquarters TAC responsibility for NTC activities was transferred from the Air Force Deputy Chief of Staff for Plans to the Deputy Chief of Staff for Operations. Concurrent with that action, on 1 November 1982, Detachment 3 was redesignated Detachment 1, 831st Air Division and placed under control of the commander of the 831st Air Division at George Air Force Base. The operations center at George AFB

---

4 (1) TAC-TRADOC Air Land Bulletins, 1 Feb, 30 Dec 82; (2) History, TAC, 1981, pp. 247-48 and 1982, pp. 238-39. (Both SECRET — Information used is UNCLASSIFIED) (3) Information on 1 Dec 1981 MOU is in ltr ATTG-OHR, TRADOC to distr, 10 Feb 82, subj: ODCST Newsletter. (4) Quotation is from Staff Summary Sheet, TAC, Office of the Deputy Chief of Staff, Operations, 27 April 81. (5) HQ, TAC, TAC Programming Plan 82-17, Coronet Zap - TAC Operations at US Army National Training Center. 15 Oct 1982 (hereafter cited as TAC Programming Plan 82-17). (6) The USAF supported only nine exercises in FY 1983 because the Army canceled Exercise 83-8 and played one OPFOR battalion against the other. Tactical Air Command, National Training Center Program Requirements Organization Briefing, 22 Sep 83 (hereafter cited as TAC, PRO Briefing, 22 Sep 83).

remained under control of the Fort Irwin detachment. Nine personnel positions were authorized for Fort Irwin, and eight positions were authorized for Detachment 1 at George Air Force Base.[5]

Meanwhile, in line with the Air Force's practice of giving names or "Flag designations" to major exercises, TAC planners began a lengthy search for an appropriate designation. The TAC Deputy Chief of Staff, Operations, Maj. Gen. John L. Piotrowski suggested the command's support activities at Fort Irwin be called "Purple Flag." Bypassing that suggestion, TAC's NTC planners chose the name "Coronet Zap" which was used only briefly. By October 1982 NTC support was being referred to only as "NTC," until a new name could be approved by the TAC commander. Faced with a list of possibilities which included among other suggestions "Mojave Gunslinger," "Armor Avenger," and "Coronet Sandblast," the commander rejected the entire list and on 10 December 1982 selected "Air Warrior." The name became official in June 1983.[6]

On 1 August 1983, TAC formalized Air Force involvement at the NTC when it published Tactical Command Exercise Plan 323 for Air Warrior. The plan established guidelines for the deployment, employment, and redeployment of Air Force elements to the NTC. It provided for the Military Airlift Command to furnish airlift support, and assigned responsibility for refueling operations to the Strategic Air Command. The plan also outlined the level of participation for the Air Force Reserve and Air National Guard. In a briefing to the TAC commander on 22 September 1983, a representative of the Directorate of Fighter Operations, Current Operations Division, summed up the past and present status of TAC support for the NTC:

> *In Sep 81, the program had a standing start with no planned funding, or plan for range instrumentation. Therefore NTC was rated red. By Apr 82 NTC operations were funded, but there was not yet a suitable plan for communications maintenance. TAC operations had been formalized and missions were being flown in support of the NTC. Progress slowed in late 82 since plans for comm[unications] and range instrumentation involved long term solutions. Funding required reprogramming $600K. Currently, we have adequate manning authorizations and the program is fully funded. Facilities are rated for the first time in the current PRO [Program Requirement Organization] assessment.*

The Air Force Presence at Fort Irwin: The Early Difficulties

The most visible evidence of Air Force presence at the NTC were the fighter planes and forward air controller (FAC) aircraft that flew overhead. However, the majority of the approximately eighty

---

5 (1) TAC-TRADOC Air Land Bulletin, 30 Dec 82. (2) Msg, Deputy Chief of Staff, Operations, TAC, to distr, 2 Oct 82, subj: Chain of Command for Sup- port of NTC. (3) Background Paper on Status of George AFB for Supporting the NTC, Deputy Chief of Staff, Operations to General Wilbur L. Creech, Commander TAC, 21 Oct 82. (4) TAC Programming Plan 82-17, p. 2.

6 (1) Deputy Chief of Staff, Operations, TAC, 3 Apr 82, subj: Title for TAC Support of the National Training Center. (2) Background Paper, Director, Fighter Operations, TAC, 20 Jun 82, subj: Title for TAC Support of the National Training Center. (3) Staff Summary Sheet, Asst Chief of Staff, Operations, 25 Oct 82, subj: Status Report on TAC Support of the National Training Center (NTC) at George AFB. (4) Staff Summary Sheet, Deputy Chief of Staff for Plans, TAC, 9 Dec 82, subj: Exercise Nickname—NTC Support. (5) History, TAC, 1983, p. 289. (SECRET — Information used is UNCLASSIFIED)

personnel who provided TAC's support to each fourteen-day training period did not fly aircraft. On the ground, tactical air control parties (TACP) provided the vital link between the Army and the Air Force by serving as liaison to the ground unit commander. A TACP was made up of a forward air controller and a tactical air communication and control specialist, whose means of transportation was usually a jeep equipped with communications equipment. In some cases a radio-equipped M113 armored personnel carrier was provided, making it possible for the ALO to remain with the main forces. During most rotations, the Air Force assigned five TACPs—one to the Blue brigade force-on-force tactical operations center (TOC), one to the brigade live-fire TOC, one to each of the two Army battalion task forces, and one to the OPFOR. During pre-NTC training at home station, the Air Force assigned an FAC to each maneuver battalion. To provide CAS, the TACP had to know the commander's operational plan, the fire support officer's plan, and be trained in the use of the CAS request systems. During the battle the FAC served as the eyes and ears of the fighter pilots as they planned for and called in air strikes and provided last-minute targeting information. Air support operations were coordinated through the NTC Airspace Control Center manned by Detachment 1.[7]

On 22 May 1984, the Chiefs of Staff of the Army and Air Force signed a historic joint memorandum of agreement designed to increase tactical coordination between air and ground forces, eliminate duplicate weapons development, and improve coordination during the budgeting process. Initiative 24 of that agreement, "Close Air Support," reaffirmed the Air Force's responsibility to provide fixed wing close air support to the Army and implicitly confirmed the Air Force commitment to take part in the training exercises at the NTC. In Initiative 25, the two services agreed to provide enhanced training for air liaison officers (ALO) and forward air controllers and to conduct an in-depth evaluation of the tactical air control party (TACP) structure.[8]

As with all other aspects of the dynamic training offered at Fort Irwin, the joint Army-Air Force experience was designed to provide lessons learned and identify continuing problems. Every Air Force unit was required to file an after action report following its tour at the NTC, to aid the Air Force in identifying its training deficiencies. The concern mentioned most often by exercise participants was the inability of the MRC 107/108 jeep used by the TACPs to operate off the road and thus keep the FAC with the main ground forces. Many commanders requested tracked M113s for the TACPs, but this proved only a partial solution. Communications equipment in the M113 lacked sufficient range to adequately link Army and Air Force elements. Use of portable radios made operations in a chemical environment impossible. Further, the M113 had a poor maintenance record and very limited visibility. An adequate solution to the mobility problem of the forward air controllers awaited fielding of the Army's high mobility multi-purpose wheeled vehicles or "HUMMWV."[9]

---

7 (1) Lt. Col. William H. Hoge, "Air Warrior—The Blue Side of the National Training Center," student essay, United States Army War College, 10 Apr 86, pp. 7-9. (2) Jeffrey P. Rhodes, "All Together at Fort Irwin," *Air Force Magazine*, December 1989, pp. 38-45.

8 For a detailed discussion of the 22 May 1984 MOA, see TRADOC Historical Review, 1 Oct 83 - 31 Dec 86, pp. 100-03 (SECRET — Information used is UNCLASSIFIED). That MOA approved a body of joint initiatives known as the "31 Initiatives," of which Initiative 25 was a part.

9 Hoge, "Air Warrior," p. 16.

Incompatibility or inadequacy of equipment also detracted from combined arms training. Pilots complained that the lack of vehicle panel markers made target acquisition difficult, especially for very fast aircraft. Air Force personnel assigned to Army units at NTC were too often not provided with personal equipment such as night vision goggles and lightweight fatigues from the Army inventory, nor were these items available in the Air Force inventory. Further, the Army and Air Force communications systems were, in some instances, not compatible. For example, the Army's UHF radios lacked the anti-jamming capability necessary to communicate with aircraft in a heavy communications jamming environment. In addition, Fort Irwin had no maintenance capability for the Air Force's communications system, a situation which made it necessary to depend on maintenance facilities at Fort Ord, Calif, 300 miles away by air.[10]

A third category of difficulties that resulted from joint training exercises involved the assignment of FACs and the definition of their roles. When working with an Army battalion, a forward air controller had a dual role. He worked with the commander and his staff as an advisor and liaison officer. In addition, he was responsible for providing close final control of fixed wing aircraft during exercises, as in actual combat operations. Thus he needed to be in a position to view both the aircraft and the target at the same time. That was seldom possible. The obvious solution to the dilemma was the assignment of two FACs to each battalion. The Air Force, however, did not have the necessary manpower to assign two FACs to every maneuver battalion in the active Army, let alone to the reserve components. Further, the practice of assigning Air Force FACs on a temporary basis to an Army unit preparing for exercises at the NTC often meant that the unit trained with one FAC but worked with another during the rotation. The FAC's lack of familiarity with the commander's operational plan could prevent the use of tactical air power to its fullest advantage.[11]

A Laser Engagement System for the Air Force?

Air Force after action reports also indicated that Air Force participants at the NTC believed that Army commanders and OCs did not value the effects of air power and ignored most of the air support they attempted to provide. Some also believed the Army perceived the NTC exercises as solely an Army training function, and that battalion commanders did not make the necessary attempts to effectively integrate CAS into the battle. That situation was, in part, the result of a lack of MILES equipment for Air Force aircraft. As in the case of noninstrumented Army vehicles, casualty assessment of air strikes was left to the subjective judgment of the OCs. Air Force personnel often complained that Army OCs did not give them credit for the damage done by fixed wing aircraft. According to one student of Air Force participation at the NTC, during one rotation in 1984, noninstrumented F-16s made more than 250 passes over tank columns but only one battle damage assessment (BDA) was recorded by controllers. The problem of assessing damages caused by noninstrumented A-10s was further complicated by the fact that it was not necessary for that aircraft to fly directly over the target it attacked. Air Force studies conducted in April 1982 had concluded

10 (1) Hoge, "Air Warrior," pp. 16-17. (2) TAC, PRO, 22 Sep 83.
11 Hoge, "Air Warrior," pp. 17-19.

that, although TAC participation in the MILES program was technically possible and desirable, the baseline system that could be fielded for the lowest cost would not provide realistic training for aircrews and might even result in "negative" training. The Air Force's concerns were reinforced by what they perceived as a lack of realism in the Army's AGES/AD laser engagement system for aircraft and by the difficulty the Army was experiencing in fielding the system. The studies also suggested that the Air Force might be better served if it concentrated on development of a "world-wide" training device rather than one peculiar to the needs of the NTC. Meanwhile, some senior Army officials believed the Air Force much preferred to use its limited resources on instrumentation for Nellis Air Force Base than to serve as a "training aid" for the Army at Fort Irwin.[12]

The issue lay dormant until 12 November 1982 when Maj. Gen. Frederic J. Brown III, TRADOC Deputy Chief of Staff for Training, wrote to Major General Robert H. Reed, TAC Deputy Chief of Staff, Operations, to express his concern that little movement had been made to address "the pivotal issue of an Air Force system to permit mutual real time casualty assessment for air and air defense" and to argue that the adoption of a system capable of recording both ground and air kills was essential to AirLand Battle training and the fulfillment of the NTC concept. Remarking that the question of laser engagement simulation for the Air Force was more than four years old, Maj. Gen. Brown expressed to Maj. Gen. Reed his fears that "we may not have basic agreement as to the fundamental desirability of mutual engagement simulation." He suggested a dedicated joint working group be established and offered to brief Reed on the Army's progress in the field of engagement simulation. Brown also warned that development of a generic or worldwide system would almost certainly cause an unacceptable delay in fielding a laser engagement system for assessing casualties at the NTC. Tactical Air Command planners agreed to meet with TRADOC officials at an unspecified time in the future to discuss the two services' differences over adoption of the system. In any case, extremely low funding priority in both the FY 1983 and FY 1984 budgets was almost certain to delay further the acquisition of an effective laser engagement system for aircraft engaged in Air Warrior.[13]

The system the Air Force hoped eventually to field to meet its commitment to the Army was compatible with the Army's MILES. Plans relegated its use solely to tactical fighters participating in exercises at the NTC. In the spring of 1984, the Air Staff validated a TAC statement of need for a laser engagement system, or LES as it had come to be known, but the project still ranked near the bottom on the Air Force's research, development, and acquisition list (154 of 157). Funds were not even available for an engineering study to determine scope, cost, schedule, and specifications for such a project. At that point the LES project manager reported to the TAC commander that "unless

12 (1) History, TAC, 1982, pp. 240-41 (SECRET — Information used is UNCLASSIFIED). (2) Background Paper, TAC Current Operations Division, 14 Apr 82, subj: Multiple Integrated Laser Engagement System for the National Training Center. (3) Hoge, "Air Warrior," pp. 22-23.

13 (1) Information Bulletin, TRADOC Cdrs Conference, 26-29 Nov 84. (2) History, TAC, 1982, pp, 240-41 and 1983, pp. 288-89 (Both SECRET — Information used is UNCLASSIFIED). (3) Background Paper, TAC Current Operations Division, 16 Apr 82, subj: Multiple Integrated Laser Engagement System for the National Training Center. (4) Ltr, Maj Gen Brown (USA) to Maj Gen Reed (USAF), 12 Nov 82. (5)Item of Interest, Maj Gen Robert H. Reed (USAF) to TAC commander, 11 Dec 82, subj: TRADOC Letter on Support of the National Training Center (NTC). (6) TAC, PRO, 22 Sep 83.

unusual measures are taken at the highest levels, LES will never materialize." Meanwhile, interest in the program had been expressed at the Army Chief of Staff level. On 22 March, Army Chief of Staff General John A. Wickham, Jr., with an Army information paper in hand, met with Air Force Chief of Staff General Charles A. Gabriel to reaffirm the importance of instrumenting Air Force aircraft at the NTC. A week later, TRADOC commander General Richardson wrote to TAC commander General Creech to express his deep concern that Air Force funding for close air support instrumentation "fell below the funding line for FY 1986." In essence, the Army believed the Air Force was not putting much effort into the development of LES. On 23 April General Gabriel directed the Directorate of Operational Requirements at Air Force Headquarters to "move out with it , but [the] program should be structured to test validity fully before procuring."[14]

Meanwhile, on 30 March 1984, General Richardson continued his correspondence with his counterpart General Creech to reassert the importance the Army placed on the availability of a MILES-compatible LES for the NTC if the training center's full benefits were to be realized. In his answering letter of 11 May General Creech assured Richardson that "we are working this issue hard," and advised him that the Air Force Systems Command would begin a study in June aimed at development of an effective LES. The study was expected to take up to a year to complete. The two commanders agreed that at their next "eight star" meeting they would fully explore the entire instrumentation issue.[15]

At the same time, Generals Wickham and Gabriel continued to discuss the issue of Air Force participation at the NTC. General Wickham continued to insist that the Air Force was moving too slowly to meet its commitment. Agreement on the importance to the NTC of an Air Force LES was proving much easier than its implementation. In September 1984, the Air Force Operations Directorate requested that while the Systems Command study was in progress, and until its results were available, the Tactical Air Command do an analysis to determine the feasibility of equipping two A-10 aircraft with a MILES-compatible offensive and defensive instrumentation capability. That action would allow the Air Force to gain "hands-on real-time experience on MILES integration issues." In discussions between TAC and Loral, the contractor responsible for development of the MILES, Loral stated that in five-to-six weeks after the contract award, they could provide TAC with offensive instrumentation—that is, laser transmitters. However, defensive capability—the employment of laser sensors on aircraft—would require considerably more time and be much more costly.

---

14 (1) Item of Interest, USAF DCS, Requirements, 4 Apr 84, subj: Laser Engagement System (1st quotation). (2) Staff Summary Sheet, USAF DCS, Plans, 2 May 84, subj: National Training Center Air Support (2d quotation).

15 (1) Ltr, General William R. Richardson to General Wilbur L. Creech, 30 Mar 84, subj: [Support for the NTC]. (2) Ltr, General Wilbur Creech (USAF), Cdr TAC to Gen William R. Richardson (USA), 11 May 84, subj: [Support for the NTC]. (3) Ltr, General Richardson to General Creech, 19 May 84, subj: [Support for the NTC]. (4) Msg, HQ USAF to HQ TAC and HQ AFSC [Air Force Systems Command], 271520Z Sep 84, subj: Quick-Look Analysis for Interim A-10 LES Capability.

Offensive laser capability alone would leave the Army with no way of determining laser hits on Air Force aircraft. The TAC study group remained convinced that the Army's MILES was an inadequate ground-to-air engagement simulation system that could not reflect "the actual vulnerabilities of the A-10 in all its aspects, as well as account for the bullet time-of-flight against a fast moving target." The atmosphere at an LES status meeting in October 1984 made clear the crux of the Army-Air Force debate over LES. On that occasion Army action officers insisted that the MILES system did provide accurate ground-to-air engagement simulation, while Air Force pilots and engineers termed the system invalid.[16]

Following that meeting, Air Force action officers indicated their approach would be to proceed with fielding only the offensive laser engagement system. Army officials privately expressed their displeasure that the initial system apparently would not have both offensive and defensive capabilities. As an ace in the hole, they contacted the MILES contractor to determine the time and cost of adapting MILES for use on a few A-10s, which could then be tested at the NTC. Loral estimated that for $500,000 they could accomplish the task in approximately six months. Should TAC's public response to its own feasibility study not be satisfactory to the Army, the plan was to offer the Air Force help with experts, MILES, and instrumentation components. Should that approach not succeed, as a last resort the Air Force could be offered the $500,000 for development purposes. In November, at a meeting of Air Force, TRADOC, and NTC representatives, Loral presented a proposal for solving the hit detection problem. The Air Force quickly rejected it. Despite the maneuvering and Army insistence on both offensive and defensive laser simulation, TAC announced in December 1984 that two A-10s equipped with only offensive engagement simulation capabilities would be flying at the NTC in January 1985. Other officials at TAC believed that at best a truly effective system could not be fielded before FY 1988.[17]

Meanwhile, some Army officials complained that the Air Force had committed too few fighter aircraft to the NTC operations to provide coverage for the force-on-force and live-fire exercises at the same time. It will be remembered that during any rotation the two exercises took place simultaneously. Because, the Army claimed, the Air Force favored the opportunity for pilots to deliver live ordnance during the live-fire scenarios, no aircraft were available on ground alert to provide CAS for the force-on- force maneuvers. At the same time, the Air Force declared a need for better joint scenario development with the Army. That was especially critical in light of the Army's policy of halting the exercise if either its Blue Force or OPFOR commander made so many mistakes that they jeopardized learning objectives. An abrupt halt to an exercise made it difficult for the Air Force to schedule aircraft support.[18]

---

16 (1) Msg, HQ USAF to HQ TAC and HQ AFSC [Air Force Systems Command], 271520Z Sep 84, subj: Quick Look Analysis for Interim A-10 LES Capability (1st quotation). (2) Msg, HQ TAC to USAF DCS, Requirements, 051106Z Nov 84, subj: Quick Analysis for Interim A-10 Laser Engagement System (LES) Capability. (3) Item of Interest, Asst DCS Requirements to Commander, TAC, 11 Dec 84, subj: Probable Visit/Phone Call by General Richardson, TRADOC Commander (2d quotation).

17 Records, Office of the Command Historian, HQ TRADOC.

18 Hoge, "Air Warrior," p. 15. (2) History, TAC, 1984, p. 109 (SECRET — Information used is UNCLASSIFIED).

To point out these continuing difficulties was not to imply that either service was disappointed with the NTC training concept. While the Army-Air Force arrangement was not entirely satisfactory to either service at the close of 1984, neither questioned the operational and tactical importance of combined arms exercises. To be sure, interservice rivalry played a large part in preventing closer cooperation. For the Air Force, the stumbling blocks appear to have been the cost of NTC participation in an era of very tight budgets, as well as the feeling that the service was being regarded simply as an expensive training aid. The Army insisted that the training offered at Fort Irwin would greatly benefit the Air Force. In addition to training in close air support operations in an unfamiliar environment and against an opposing force, Air Warrior offered the Air Force training in mobilization, air-ground operations skills, the deployment of equipment and personnel, and in the maintenance of equipment. Be that as it may, the Army made clear that command and control at the NTC was and would remain solely an Army function. But for both the Army and the Air Force, the establishment of integrated training exercises kept in the forefront the continuing debate between the services as to how and by whom close air support should be controlled in combined arms operations. Given those tensions, it must be acknowledged that in a venture as ambitious and innovative as the one at Fort Irwin, as some problems were solved, others were bound to arise. Senior officials of both services believed that cooperation between the services would markedly improve as doctrinal, organizational, materiel, and training incompatibilities were worked out. Despite the number of problems that still awaited solutions at the end of the NTC's initial implementation period, both the Army and the Air Force generally found training at the NTC valuable and were committed to providing the best combined arms training possible for United States military forces.

CONCLUSION

On the day of battle, soldiers and units will fight as well or as poorly as they were trained before battle.

—FM 100-5, 20 August 1982, p. 1-4

As the National Training Center reached the end of its first phase of development late in 1984, those officers who had conceived the idea, the military and civilian personnel who had supported it, and those instrumental in "making it happen" could look back on eight years of ups and downs, many successes, and some remaining challenges. In the NTC's first three years of formal operation, more than fifty battalions had experienced combined arms training there. The training center in the Mojave seemed to have reached a break-even point between what had been an excellent but unproven concept in the mid 1970s and the reality of a facility that, by the close of 1984, offered the best possible training short of war. By that time the training center had advanced well beyond the "go, no go" status it had suffered in its early days. The NTC had also begun to demonstrate an impressive potential for the validation of training, doctrine, equipment, organization, and readiness. As 1984 ended, senior officials at Headquarters Department of the Army, TRADOC, FORSCOM, and the NTC assessed the status of the National Training Center and its future. General John A. Wickham, Jr., Chief of Staff of the Army, termed the NTC "a total success story." "Over time," he believed, "the NTC's tough, stressful training environment will produce officers, NCOs and soldiers who are more technically and tactically proficient and will validate our evolving doctrine." General Robert W. Sennewald, FORSCOM commander, observed that the level of support the NTC had received from Headquarters Department of the Army, had made it "the finest training environment for heavy forces ever experienced in our Army," and had "laid the cornerstone for evolution of NTC future direction." In a report to TRADOC commander General William R. Richardson, the NTC commander, Brig. Gen. Edwin S. Leland noted that "the spirit and will to win is evident" and that returning units had trained hard to correct deficiencies previously identified. Another success story, according to Leland, was the soldiers' increased understanding of the philosophy of fighting as a combined arms team. After a visit to the NTC in November 1984, General Richardson was well satisfied with how far the NTC had come.[1]

---

1 (1) Shackelford, "NTC Perspectives." p. VI-1. (2) Msg, CofS of the Army to distr, 071625Z Sep 84, subj: NTC Policy Statement, Richardson Papers. (3) Msg, Cdr FORSCOM to HQDA, 172230Z Oct 84, subj: NTC Policy Statement. (4) Msg, Cdr NTC to Cdr TRADOC, 022200Z Jul 84, subj: Training Observations (CONFIDENTIAL — Information used is UNCLASSIFIED). (5) MFR, General William R. Richardson, TRADOC Cdr, 9 Nov 84, subj: Visit to the West Coast, Richardson Papers.

In the late 1970s and early 1980s, several forces had come together to make the NTC's transition from concept to reality possible. The fielding of sophisticated new weapons systems such as the M1 tank, and the development of new AirLand Battle doctrine had left little doubt that in the future, ranges and land for training at home station would become increasingly inadequate. In addition, the experiences of the United States Army in Vietnam had prompted the development of a new training system that revealed the need, in peacetime, for tactical unit training in a realistic battlefield setting. Those changes came about against a background of rapidly advancing technology that brought into being instrumentation capable of assessing the performance of leaders, men, and machines during force-on-force and live-fire exercises. But none of those factors would have been sufficient to ensure establishment of the NTC had it not been for the favorable defense budgets of the late Carter and early Reagan administrations. In a more austere financial climate, it is likely that the most costly single training venture in peacetime history would not have survived the scrutiny and criticism of a budget-slashing Congress. Even given the fortuitous coming together of all those factors, in the last analysis it was the human factor that acted as the catalyst in assuring the continued development of the NTC in the face of a multitude of difficulties.

From the first, key senior officers at Department of the Army headquarters and at the Training and Doctrine Command and the Forces Command maintained their dedication to the National Training Center concept and to its successful implementation. At the Chief of Staff level, Generals Bernard W. Rogers, Edward C. Meyer, and John A. Wickham, Jr. all gave the NTC strong support, as did many members of their staffs. At the Training and Doctrine Command, the birthplace of the NTC concept, commanding generals William E. DePuy, Donn A. Starry, Glenn K. Otis, and William R. Richardson took a deep personal interest in the training center's success. After Maj. Gen. Paul F. Gorman left the office of TRADOC Deputy Chief of Staff for Training to command the 8th Infantry Division (Mechanized) in Germany, the traditions of that office lived on through his "apostles and disciples." As commanders of the Combined Arms Center, Lt. Gen. Richardson and Lt. Gen. Carl E. Vuono were strong supporters of the NTC, as were the commandants of the Command and General Staff College. After some initial hesitancy, FORSCOM commanders General Robert M. Shoemaker and Richard E. Cavazos accomplished the difficult tasks of reactivating Fort Irwin and of scheduling and preparing troops for their rotations there. Like General Richardson, many of the key players in the NTC story served in more than one position where their influence had a positive impact on NTC development. By no means did this exhaust the list of those who made a difference in the NTC's

coming of age. Throughout this study there are accounts of the activities of scores of officers, soldiers, and civilians without whom the outcome of the NTC project might have been very different.[2]

Even though Generals Wickham, Richardson, and other senior officers were understandably proud of the NTC and optimistic about its future, they were not blind to the fact that a number of problems remained to be solved as 1984 drew to a close. In the same message in which he termed the training at Fort Irwin a "total success," Wickham acknowledged that the NTC had not lived up to its potential to identify and distribute "lessons learned" to the total Army: "While remaining true to the training mission, the NTC should also be a training opportunity where new ideas for the Army, in techniques, equipment, tactics, and doctrine can be applied." After a visit to the NTC in 1984, General Richardson expressed similar concerns that "we are not taking the data that comes out of the lessons learned and drawing from it some lessons on doctrine, tactics, techniques and procedures." The application of doctrine particularly concerned him. He detected a tendency of commanders to disregard movement techniques in favor of speed, a situation that often resulted in contact with the enemy by a majority of the force rather than with the smallest force possible, as set down in the doctrine. In short, commanders were clinging to the concept of a force oriented defense that had been a part of the active defense, and that tended to inhibit maneuver. Richardson attributed that shortcoming to current Army manuals that were "not reflective of maneuver doctrine." Obviously, the lessons learned at the NTC were not being "fed back into the school system," nor were they contributing substantially to the doctrine development process.[3]

Other problems that awaited solution included the continuing inability to effectively simulate indirect fire and the difficulties of integrating U.S. Air Force elements into the training exercises so that all dimensions of the battlefield were represented. The production of always reliable data via the instrumentation system and a methodology for analyzing that data seemed far from a final solution. In addition, the battlefield operating systems employed as criteria for evaluating unit performance did not match up well with the Army Training and Evaluation Program guidelines. Many close to the NTC operations worried that commanders' fear of failure in their NTC mission would drive all training time and resources at home station. Special efforts needed to be made to ensure that the NTC did not become a test of a commander's fitness for promotion. After a unit's rotation, a better system

---

2 Dr. Rodler F. Morris, the CAC Historian, has called the 8th Infantry Division (Mech) an "incubator for Gormanite ideas and votaries." General Carl E. Vuono, an alumnus of the 8th ID who later became Chief of Staff of the Army, served as CAC commander during the NTC's early years. Major Generals Howard G. Crowell, Jr. and Frederic J. Brown III both served with Gorman in Europe and later occupied his old post as TRADOC Deputy Chief of Staff for Training (Crowell, 1980-1981; Brown, 1981-1982). Brown's successor as DCST, Brig Gen Maurice Edmonds had been assistant DCST. Maj Gen John W. Seigle, who was Crowell's predecessor as DCST, did not serve with Gorman in the 8th ID, but as a "Gormanite" he succeeded Gorman as President of the Combat Arms Training Board (later redesignated the Army Training Board) during 1972-73. Morris, JRTC, pp. 41-42. In Brownlee and Mullen, *Changing an Army*, General DePuy dubbed Gorman's following, his "apostles and disciples," p. 185.

3 (1) Msg, CofS, Army to distr, 071625Z Sep 84, subj: NTC Policy Statement, Richardson Papers. (2) MFR, General William R. Richardson, 7 Feb 84, subj: Visit to the National Training Center, Richardson Papers.

was needed to encourage home station trainers to focus on the deficiencies identified in the take home packages and use those packages as a basis for future training programs.

Most of the major problems remaining invited more or less tangible solutions, and most were being addressed. There were, however, some questions concerning the effectiveness of NTC training that had to remain unanswered until that training was tested in actual combat. The battles at the NTC were, after all, mock battles. Unlike real weapons, laser beams did not kill. When a soldier was declared "dead" on the simulated battlefield, he returned to action with a little more experience. Concern for safety and the want of technology prevented the NTC from adequately simulating indirect fire. What effect would artillery barrages have on men not prepared for that experience? With the air filled with hot metal, tankers might have to abandon the practice of fighting with open hatches and the visibility that that luxury allowed. Would commanders and their troops risk, in a true killing situation, the audacity and innovation so celebrated on the simulated battlefield? Would the element of fear cause paralysis or promote more assertiveness and the taking of greater risks? Did NTC training really substitute for the first battles of a real war, or would the violence, horror, and confusion of a modern high intensity war prove such a shock as to make the first days of a conflict the real training period?

While problems remained and questions still sought answers, the National Training Center that had been put in place by the mid-1980s offered the most comprehensive attempt ever to create a realistic training environment for a modern Army. The NTC program exceeded any previous Army training program in terms of units involved, and land area, personnel, and equipment required. It also exceeded any previous program in terms of cost. But, in a time of massive expenditures for weapons systems, the benefits to force readiness that the NTC promised far outweighed its price tag as far as Army and Defense Department economists were concerned. In general, senior Army and Department of Defense officials were pleased with the unique and exciting training facility at Fort Irwin. Although the terrain and climate did not closely resemble the European theater where, in the early 1980s, the Army faced its most serious security challenge, the NTC did offer experience in the conditions of combat common to all theaters. Present were a "real" enemy, mental and physical stress, rapidly changing combat situations, and the necessity of good command leadership and combat support. If a soldier's first ten missions were his proving ground, the Army hoped to offer the equivalent of those first missions at Fort Irwin. In the words of General Wickham:

> *The Army is committed to providing adequate resources for the NTC. This commitment will assure that our training and innovation payoffs increase the capability and readiness of the total Army. We all must work together to harness the NTC's full potential and spread the NTC experience throughout the total Army.*[4]

The concept of realistic combat exercises against a superbly trained opposing force envisioned in 1976 by only a few, had by 1984 become a reality for many.

---

4 Msg, CofS, Army to distr, 071625Z Sep 84, subj: NTC Policy Statement (quotation).

EPILOGUE

In the late summer of 1984, General John A. Wickham, Jr., Chief of Staff of the Army, dubbed the National Training Center "a total success." Over the next seven years, efforts continued at all levels to improve the realism of the training environment, to establish a more effective training evaluation system, and to better capitalize on the NTC data collection through an improved lessons learned system. A detailed discussion of the NTC from 1985 to date must await a sequel to this volume. It may, however, be helpful to the reader to take a brief look ahead from 1984 at some of the highlights of the continuing development of the NTC.

Because it appeared that many of the problems of the training center's first years had been solved by the mid-1980s, General Wickham believed the time had come to examine the status of the training center and to develop plans for its future. As a result, training developers at TRADOC, CAC, and the NTC drew up an NTC Future Concept that they briefed to the Vice Chief of Staff of the Army in October 1986. The concept established development guidelines for the NTC over the next ten years. A key point of the concept was the retention of the training focus on the maneuver battalion task force but with a commitment to move toward brigade level operations. Some senior Army officials believed that training for a full brigade would provide a more realistic battlefield environment and enhance training in command and control. The suggestion of such a move, however, caused considerable controversy. Neither the TRADOC commander General William R. Richardson nor the FORSCOM commander General Richard E. Cavazos approved of a move to brigade size rotations. Despite the strong objections, the Army went ahead with plans to acquire an additional 260,000 acres of land adjacent to Fort Irwin, that the NTC would need to support brigade level training.[1]

As officials at the NTC, TRADOC, FORSCOM, and the Department of the Army continued in the mid-1980s to debate the future direction of the NTC, the Army went ahead with plans to establish a similar facility for the training of airborne, air assault, Ranger, Special Operations, and light infantry battalions in low- to mid-intensity conflict. A protracted controversy had ensued over whether light forces should receive force-on-force training along with heavy forces at the NTC or at a separate facility dedicated only to the training of light forces. The compromise solution resulted in the establishment of the Joint Readiness Training Center (JRTC) which opened at Fort Chaffee, Ark. in

---

1 (1) Msgs, Cdr TRADOC to CSA, 301911Z Jul 84, subj: Alternative Concepts for NTC; Cdr FORSCOM to CSA, 231900Z Aug 89, subj: Alternate Concepts for NTC. (2) Semiannual Staff Historical Report, ODCST, 1 Oct 86 - 31 Mar 87, p. 110 and 1 Apr 67 - 30 Sep 87, p. 91. (3) MFR, General William R. Richardson, 6 Jun 86, subj: Visit to the NTC. (3) *Los Angeles Times*, 29 Sep 89, p.3.

October 1987. Meanwhile, FORSCOM began scheduling rotations of a mixture of heavy and light forces at the NTC. The first of those rotations began late in 1985.[2]

As the Army looked ahead to the training of the first light forces at the JRTC and to heavy/light rotations at the NTC, it began planning for the establishment of a Combat Maneuver Training Complex (CMTC) at Hohenfels, Germany. That facility would provide European-based U.S. Army troops with the same realistic combined arms training exercises as those offered at the NTC. Concurrently, plans went forward to furnish advanced training opportunities for active and National Guard division and corps commanders, their staffs, and major subordinate commanders. In January 1987, the Chief of Staff of the Army approved the concept of a Battle Command Training Program (BCTP) to train senior commanders in warfighting skills. The BCTP program featured a seminar at Fort Leavenworth followed by a computer-driven warfighter command post exercise.[3]

With all the activity to establish sites and programs for advanced training, the effort to develop a "futures concept" took a new turn. On 23 January 1987, General Wickham approved a "master concept" which would, in effect, bring the NTC, JRTC, CMTC, and BCTP all under a unified training concept. Most of the issues addressed in the NTC Futures concept were outlined in what became known as the Combat Training Centers concept and detailed in a Master Plan for its implementation. The Master Plan was designed to chart a course for the combat training centers from 1990 through FY 2000 via a centrally managed program. When all the elements of the program were fully operational, the Army expected to have the ability to train heavy, light, heavy-light, and special operations forces, at all levels of organization, across the conflict continuum. Specific NTC plans for the future included expansion to support brigade level training as well as contingency operations for a force composed of a mixture of light, heavy, and special operations forces. Plans also included the upgrading of the NTC Operations Center and the instrumentation system and improvements to MILES and the live-fire range. The move to a new Operations Center was completed in June 1990.[4]

Several of the major problems of the NTC's early years continued to concern TRADOC's training developers in the 1985-1991 period. Efforts to develop a Combined Arms Team Integrated Evaluation System (CATIES) and to follow that system with the Simulation of Area Weapons

---

2 (1) Enclosure, subj: TRADOC Position on Light Force NTC Training, to ltr, Col Louis Hightower to Cdr FORSCOM, 29 Jan 85. subj: National Trainaing Center Long Term Development. (2) Msg Cdr TRADOC to CSA, 172000Z Sep 84, subj: NTC Training for Light Forces. (3) Morris, "Joint Readiness Training Center (draft study) pp. 104-07, 113-15.

3 (1) Issue Summary Sheet, ODCST, 18 Oct 88, subj: Combat Maneuver Training Center (CMTC) (2) End of Tour Report, Thurman to Vuono, August 1989. The original name of the proposed training center at Hohenfels was the "Combat Maneuver Training Center."

4 (1) Vision 91 Briefing, ODCST, TRADOC Commanders' Conference, 4-7 Oct 88. (2)AR 350-50, Combat Training Center Program, 27 May 88. (3) Issue Summary Sheet, ODCST, 18 Oct 88, subj: National Training Center. (4) NTC Futures Concept, pp. iii-iv. (5) Semiannual Staff Historical Report, ODCST, 1 Jan-30 Jun 89, pp. 90, 91.

Effects—Radio Frequency provided hope for a solution to the problem of simulating indirect fire and assessing casualties from artillery and mortar fire. Likewise, the closely associated issue of the safe simulation of nuclear, biological, and chemical warfare received much attention. The establishment of a viable lessons learned system became a primary concern as the Army sought ways of amortizing its large investment at Fort Irwin. In August 1985, in an effort to institutionalize a lessons learned system, a Center for Army Lessons Learned (CALL) was established at the Combined Arms Center as a directorate of the Combined Arms Training Activity. At the same time, the Combined Arms Integration and Standardization Directorate of CATA added a separate team for NTC lessons learned. Five months later the NTC team was absorbed into CALL. In an effort to better manage the NTC data collection, the Army also established a Data Analysis Center at the Army Research Institute element at the Presidio of Monterey, California, and a Combat Analysis Laboratory at the RAND Arroyo Center at Santa Monica, California.[5]

A number of improvements had been made in Army-Air Force cooperation and coordination at the NTC since 1984. A better definition of the Air Force role and the integration of airpower into the Army's fire support planning process had been achieved. The two services had, by and large, solved the problem of providing support equipment for Air Force ground liaison personnel. The fielding of the Army's "High Mobility Multipurpose Wheeled Vehicle" or HMMWV, went far toward solving the problem of keeping the Air Force forward air controllers and their tactical air control parties with the main body of ground troops. In 1988 the two services finally came to an agreement over the alignment of Air Force air liaison officers with Army units. Development efforts to provide compatible communications systems and MILES-compatible instrumentation for fixed wing aircraft continued. Remaining to be solved was the procurement of a close air support aircraft to replace the Air Force's A-10.[6]

As the U.S. Army's National Training Center at Fort Irwin in California's high desert region celebrated its tenth anniversary, the Army and the nation had reason to celebrate the continued development and success of the 1,000 square mile training area. A majority of the combat troops deployed to the Arabian peninsula in Operations DESERT SHIELD and DESERT STORM had already experienced "war" in the desert as a result of their training at the NTC. The ability of those troops to adapt to adverse desert conditions was, at least in part, due to the force-on-force maneuvers and live-fire exercises so many had participated in at Fort Irwin. In any case, at least one continuing criticism of the NTC was largely put to rest. From the beginning, some NTC critics had objected that the terrain on which soldiers trained at Fort Irwin little resembled that of Europe where it was believed heavy forces would face the Army's most serious threat. In the wake of the formal end of the cold war, and the signing of the Conventional Forces in Europe (CFE) reduction treaty in November 1990,

---

5 (1) Fact Sheet and Briefing Slides, Senior Artillery Leaders Training Conference, Fort Sill, 30 Mar 90, subj: Combined Arms Team Integrated Evaluation System. (2) ODCST Significant Activities, ATTC-ZX, 22 Dec 86. (3) CAC Annual Historical Review, 1986, pp.118-19. (4) Vetock, *Lessons Learned*, p. 125. (5) Briefing Slides, ODCST, TRADOC Commanders' Conference, November 1985.

6 (1) Hoge, "Air Warrior," pp. 13-22. (2) Col Robert D. Reynolds, USAF, "Artillery/Aircraft Airspace Coordination," TAC-TRADOC-ALFA AirLand Bulletin 89-4, p. 3.

ground war in Europe could no longer be considered the most serious threat. But the training in the desert was not to be for nought. In the last analysis, it would be in the deserts of the Arabian Peninsula that the National Training Center's training system would meet its trial by fire.

LIST OF ACRONYMS AND ABBREVIATIONS

AAR	after action review
ACTF	Advanced Collective Training Facilities
AFSC	Air Force Systems Command
AGES/AD	Air Ground Engagement System/Air Defense
ALB	AirLand Battle
ALB-F	AirLand Battle-Future
ALO	air liaison officer (USAF)
AMC	U.S. Army Materiel Command
AOE	Army of Excellence
AR	Army regulation
ARI	U.S. Army Research Institute for the Behavioral and Social Sciences
ARTEP	Army Training and Evaluation Program
ASA	Assistant Secretary of the Army
ATP	Army Training Program
ATSC	U.S. Army Training Support Center
AWC	U.S. Army War College
BCTP	Battle Command Training Program
BDA	battlefield damage assessment
BOS	battlefield operating systems
CAC	U.S. Army Combined Arms Center and Fort Leavenworth
CACDA	U.S. Army Combined Arms Combat Developments Activity
CAL	Center for Army Leadership
CALL	Center for Army Lessons Learned
CAS	close air support
CATA	Combined Arms Training Activity
CATRADA	Combined Arms Training Development Activity
CATS	Combined Arms Training Strategy
CDC	U. S. Army Combat Developments Command
CDEC	U.S. Army Combat Developments Experimentation Command

CFE	Conventional Forces in Europe (Treaty)
CGSC	U.S. Army Command and General Staff College
CIS	Core Instrumentation Subsystem
CofS	chief of staff
CONARC	U.S. Continental Army Command
CSA	Chief of Staff of the Army
CSSTP	Combat Service Support Training Program
CTC	Combat Training Centers
CY	calendar year
DA	Department of the Army
DARCOM	U.S. Army Materiel Development and Readiness Command
DARPA	Defense Advanced Research Projects Agency
DCG	deputy commanding general
DCS	deputy chief of staff
DCS	Deputy Commander for Support (NTC)
DCSOPS	Deputy Chief of Staff for Operations and Plans (DA)
DCST	Deputy Chief of Staff for Training (TRADOC)
DCT	Deputy Commander for Training (NTC)
DPCA	Deputy for Personnel and Community Affairs (NTC)
DPTSEC	Deputy for Plans, Training, and Security (NTC)
EMC	exercise management control
FAC	forward air controller (USAF)
FACC	Ford Aerospace and Communications Corporation
FM	field manual
FORSCOM	U.S. Army Forces Command
FY	fiscal year
GAO	General Accounting Office
GD/E	General Dynamics and Electronics Corporation
HFM	heavy force modernization
HHC	headquarters and headquarters company
HMMWV	High Mobility Multipurpose Wheeled Vehicle

IDF	Israeli Defense Forces
JFDI	Joint Force Development Initiatives
JRTC	Joint Readiness Training Center
LES	laser engagement system (USAF)
LOGPACS	logistical packages
MAC	U.S. Air Force Military Airlift Command
MACOM	major Army command
MILES	Multiple Integrated Laser Engagement System
MILPERCEN	Military Personnel Center
MLRS	Multiple Launch Rocket System
MOU	memorandum of understanding
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NTC	National Training Center
OC	observer-controller
ODCSOPS	Office of the Deputy Chief of Staff for Operations and Plans (DA)
ODCSRM	Office of the Deputy Chief of Staff for Resource Management (TRADOC)
ODCST	Office of the Deputy Chief of Staff for Training (TRADOC)
OPFOR	opposing forces
PARR	Program Analysis and Resource Review
PM	project or program manager
PMP	Personnel Management Plan
POM	Program Objective Memorandum
POMCUS	prepositioning of materiel configured to unit sets
PRO	Program Review Organization (USAF)
RC	reserve components
RDMS	Range Data Measurement Subsystem (also RMS)
RD&A	research, development, and acquisition

RETO	Review of Education and Training for Officers
RFP	request for proposals
RMCS	Range Monitoring and Control Subsystem
ROAD	Reorganization Objective, Army Divisions
SA	Secretary of the Army
SAC	U.S. Air Force Strategic Air Command
SAI	Science Applications, Inc.
SAIC	Science Applications International Corporation
SAWE	Simulated Area Weapons Effects
SBA	Small Business Administration
SLUFAE	surface-launched unit fuel-air explosive
SME	subject matter expert
TAC	U.S. Air Force Tactical Air Command
TACP	tactical air control parties (USAF)
TAF	Training Analysis and Feedback
TAFO	Training Analysis and Feedback Officer
TCATA	TRADOC Combined Arms Test Activity
TDA	table of distribution and allowances
THP	take home package
THRC	TRADOC Historical Records Collection
TOC	Tactical Operations Center
TOE	table of organization and equipment
TRADOC	U.S. Army Training and Doctrine Command
USAR	U.S. Army Reserve
USAREUR	U.S. Army Europe
UTD	Unit Training Directorate (CATRADA)
VCSA	Vice Chief of Staff of the Army
VISMOD	visually modified

SELECTED BIBLIOGRAPHY

NOTE: Unless otherwise cited, all primary documents used in this study are located at the Office of the Command Historian, Headquarters, U.S. Army Training and Doctrine Command, Fort Monroe, Virginia.

Primary Sources

Research Collections

Fort Leavenworth, Kansas. U.S. Army Combined Arms Center Operational Records Collection.

Fort Monroe, Virginia. Headquarters, U.S. Army Training and Doctrine Command. Office of the Command Historian. Current History Archives, TRADOC Historical Records Collection (THRC)

_____. Headquarters, U.S. Army Training and Doctrine Command. Office of the Command Historian. National Training Center File, THRC.

_____. Headquarters, U.S. Army Training and Doctrine Command. Office of the Command Historian. Reference Files, THRC.

_____. Headquarters, U.S. Army Training and Doctrine Command. Office of the Command Historian. Papers of General William R. Richardson, THRC.

Langley Air Force Base, Virginia. Tactical Air Command History Office Archives.

Contractors' Reports

Ford Aerospace and Communications Corporation. NTC1A Final Report, 20 May 1980.

Forsythe, Thomas K. and William J. Doherty for BDM Corp. "An NTC Live Fire Performance Analysis," ARI, April 1987.

Goldsmith, Martin. "Applying the NTC Experience — Incidence of Ground-to-Ground Fratricide." Rand Corporation for the U.S. Army, February 1986.

Levine, Robert A., Hodges, James S., and Goldsmith, Martin. "Utilizing the Data from the Army's National Training Center: Analytical Plan." Rand Corporation for the U.S. Army. June 1986.

McGraff, William B., et al. Science Applications, Inc. for the U.S. Army Training and Doctrine Command and the Defense Advanced Research Projects Agency. Report of Findings on National Training Center Functional Design and Development Schedules, December 1978.

Science Applications, Inc. for the U.S. Army Training and Doctrine Command. NTC Analysis Final Technical Report, March 1981.

Systems Planning Corporation for the U.S. Army Training and Doctrine Command. National Training Center Phase I Acquisition and Development Support Final Technical Report, December 1980.

Reports, Theses, and Papers

Army Science Board Ad Hoc Sub-Group Report on the Army National Training Center, March 1981.

Briefing, National Training Center, TRADOC to Vice Chief of Staff, U.S. Army, 10 February 1978.

Furman, John Scott and Wampler, Richard Lynn. "A Methodology for the Evaluation of Unit Tactical Proficiency at the National Training Center." M.S. Thesis. Naval Postgraduate School, March 1982.

Gorman, Maj. Gen. Paul F. "Toward a Combined Arms Training Center". TRADOC Concept Paper, November 1976.

_____. "Toward National Training Centers (NTC)". TRADOC Concept Paper. 23 May 1977.

Herndon, Lt. Col. Robert L. "The Army's National Training Center: A Case Study in Management of a Large Defense Project." M.S. Thesis, Massachusetts Institute of Technology, April 1983.

Hoge, Lt. Col William H. "Air Warrior — the Blue Side of the National Training Center." U.S. Army War College Student Essay, 1986.

Norris, Col. John W. "Lesson Learning — the Army System." U.S. Army War College Military Studies Program, Carlisle Barracks, Pennsylvania, 16 January 1990.

Reischl, Timothy James. "An Examination of Battalion Training at the National Training Center." M.S. Thesis. Naval Post- graduate School, May 1980.

Shackelford, William L. "NTC Perspectives," 1985.

Simpson, Col Kenneth W, Hale, Lt. Col. David R.E., and Sutherland, St. Col. Bryan A. "The National Training Center: A Critique of Data Collection and Dissemination." A National War College Strategic Study, March 1985.

Stewart, Richard W. "Analyzing the CTC Experience: A Paper Delivered to the U.S. Army Training and Doctrine Command Historian's Conference," January 1990.

Thurman, General Maxwell R. End of Tour Report to the Chief of Staff of the Army, August 1990.

Training and Doctrine Command Combined Arms Test Activity Final Report FT 398. National Training Center Phase I Concept Evaluation for Instrumented Live Fire, June 1979.

Webster, Capt. William G., Jr. "Using U.S. Army National Training Center (NTC) Lessons Learned to Improve Combat Readiness." M.A. Thesis. Advanced Military Studies Program, U.S. Army Command and General Staff College, 1984.

Whitmarsh, Patrick J. and Banks, James H, eds. "An Overview of ARI's Research Program on the National Training Center." Research Report # 1447. Symposium Proceedings, August 1987.

U.S. Government Documents

U.S. Congress. House. Defense Subcommittee of the Committee on Appropriations. *Department of Defense Appropriations for Fiscal Year 1980*. 96th Cong., 1st sess., 1979.

United States General Accounting Office Report to the Secretary of the Army. "Impact of the Army's National Training Center on Improving Individual Soldier and Unit Readiness," 2 March 1984.

_____. "Army Training: National Training Center's Potential Has Not Been Realized," 23 July 1986.

United States Army Publications

Headquarters, Department of the Army, Washington, D.C.

Army Regulation 350-50, *National Training Center*, 15 March 1980.

Army Regulation 350-50, *Combat Training Center Program*, 27 May 1988.

Army Regulation XXX-XX, *Adapting for Combat Lessons Learned* (draft), n.d.

Department of the Army Historical Summary: Fiscal Year 1980 [Lenwood Y. Brown, ed]. Washington, D.C.: Center of Military History, United States Army, 1983.

Department of the Army Historical Summary: Fiscal Year 1981 [Christine O. Handyman, ed.]. Washington D.C.: Center of Military History, United States Army, 1988.

FM 71-1, *The Tank and Mechanized Infantry Company Team* (Coordinating draft), April 1982.

FM 71-2, *The Tank and Heavy Company Task Force*, 30 June 1977.

FM 100-5, *Operations*, 1 July 1976.

Edward C. Meyer, General, United States Army, Chief of Staff, June 1979 - June 1983. Chief of Military History and Center of Military History. 18 July 1984.

Wickham, General John A., Jr. *Collected Works of the Thirtieth Chief of Staff*. Office of the Chief of Staff, June 1987.

United States Army Agencies' Publications

Army Training Study (draft), Report Summary. U.S. Army Training and Doctrine Command, 8 August 1978.

Brownlee, Lt. Col.Romie L. and Mullen, Lt. Col. William J. III. *Changing an Army: An Oral History of General William E. DePuy, USA Retired.* U.S. Army Military History Institute, Carlisle Barracks, Pennsylvania.

Herbert, Maj. Paul H. *Deciding What Has to be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations.* Leavenworth Papers No. 16. Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, July 1988.

Meller, Sgt. Sidney L. The Desert Training Center, C-AMA. Study 15. Historical Section, Army Ground Forces, 1946.

National Training Center Development Plan. U.S. Army Training and Doctrine Command. Fort Monroe, Virginia, 3 April 1979.

National Training Center Handbook. U.S. Army Research Institute for the Behavioral and Social Sciences: Presidio of Monterey Field Unit Training Research Laboratory, July 1984.

Romjue, John L. *Development of Instrumentation Technology for Military Field Experimentation: U.S. Army Combat Developments Experimentation Command, 1956-1973,* June 1974.

Romjue, John L. *From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973-1982.* TRADOC Historical Monograph Series. Henry O. Malone, Jr., ed. Fort Monroe, Virginia, U.S. Army Training and Doctrine Command Historical Office, June 1984.

U.S. Army Combined Arms Center and Fort Leavenworth Annual Historical Reviews. Fort Leavenworth, Kansas: Combined Arms Center History Office, 1981-1989.

U.S. Army Forces Command Annual Historical Reviews, Forces Command History Office, Fort McPherson, Georgia, 1976-1988.

U.S. Army Training and Doctrine Command Annual Historical Reviews [variously called Annual Report of Major Activities and Annual Command History]. Fort Monroe, Virginia, Office of the Command Historian, FY 1976-FY 1983; CY 1984-CY 1989.

U.S. Continental Army Command Annual Historical Summary, FY 1971, FY 1972. Fort Monroe, Virginia.

Vetock, Dennis J. *Lessons Learned: A History of U.S. Army Lesson Learning,* 1986. U.S. Army Military History Institute, Carlisle Barracks, Pennsylvania.

Warnick, William L. and Smith, Norman D. "Battlefield Realism: The Impact of Opposing Force (OPFOR) on Friendly Force Task Performance with Implications for the National Training Center." Vol I. U. S. Army Research Institute for the Behavioral and Social Science: Fort Hood Field Unit, February 1981.

Word, Col. Larry E. "Observations from Three Years at the National Training Center." Carl A. Johnson, ed. U.S. Army Research Institute for the Behavioral and Social Sciences: Presidio of Monterey Field Unit, September 1986.

Secondary Sources

Books

Bolger, Daniel P. *Dragons at War: 2-34th Infantry in the Mojave.* Navato, California: Presidio Press, 1986.

Weigley, Russell F. *History of the United States Army.* Enlarged Edition. Bloomington, Indiana: Indiana University Press, 1984.

McDonough, James R. *The Defense of Hill 781: An Allegory of Modern Mechanized Combat.* Novato, California: Presidio Press, 1988.

Articles

Binder, L. James. "The War Is Never Over at Fort in the Mojave." Army (April 1983), pp. 31-32.

Brown, SFC Michael. "Learning the Hard Way." *Soldiers* (February 1984), pp. 14-19.

_____. "Live From the NTC — It's the War." *Soldiers* (February 1984), pp. 26-28.

Business Wire, 13 April 1987.

Combined Arms Training Notes. "Good Planning Pays Off." *Army Trainer* (Winter 1984), pp. 28-31.

_____"LOGPACS." *Army Trainer* (Spring 1985), pp. 30-33.

Davis, Sp5 Steve. "OPFOR: Life on the Other Side." *Soldiers* (December 1980), pp. 50-52.

Downing, Col. Wayne A., Riley, Lt. Col.James R., and Rodriquez, Capt. David M. "Training for Maneuver Warfare." *Military Review* (January 1984), pp. 16-27.

Fetig, Maj. James. "NTC Tips." *Army Trainer* (Winter 1982), pp. 18-20.

House, Maj. Randolph W. "NTC Live Fire: One Step Closer to Battlefield Reality." *Military Review*, March 1980.

Humphrey, Maj. Vernon H. "Winning at the NTC: Reconnaissance." *Infantry* (January-February, 1984). pp. 35-36.

Johnson, Quinn G. "They All Hate the Bad Guys at NTC's Mojave." *Army* (June 1987), pp. 42-49.

Johnson, SSG Rico. "MILES." *Army Trainer* (Winter 1981-82), pp. 26-28.

Keays, SSG Ann. "National Training Center." *Army Trainer* (Winter 1981-82), pp. 5-9.

Los Angeles Times, 5 April 1989, 29 September 1989.

Morgan, Lt. Col. (Ret) Thomas D. "BCTP: Preparing for War." *Military Review* (November 1989), pp. 3-10.

New York Times. "What the Reserves Can Really Do." 11 November 1990, p. E-4.

O'Keefe, James W. and Frandson, Karla. "U.S. Army NTC Advances Realism in Battalion Level Training." *Defense Electronics*, June 1982.

Reynolds, Col. Robert D. (USAF). "Artillery/Aircraft Airspace Coordination." *TAC-TRADOC-ALFA Airland Bulletin* 89-4 (December 1989), pp. 3-11.

Rhodes, Jeffrey P. "All Together at the National Training Center." *Air Force Magazine* (December 1989), pp. 38-45.

Robbins, Jim. "America's Red Army." *New York Times Magazine* (17 April 1989), pp. 38-42.

Schaefer, PFC Randy. "Task Force Battles in Mojave." *Army Trainer* (Summer 1986), pp. 21-23.

Souza, SFC Charles R. "MILES Training Takes Wings." *Army Trainer* (Spring 1984), pp. 32-33.

Strescino, Sp5 Peter K. "Swapping Swamp for Desert." *Soldiers* (February 1984), pp. 29-33.

Thurman, General Maxwell R. "TRADOC Evolving to Meet the Threat." *Army* (October 1987), pp. 52-63.

U.S. News and World Report, 20 April 1982.

Vuono, General Carl E. "Address to the Annual Meeting of the Association of the United States Army." *Army* (December 1989), pp. 45-49.

_____. "Today's U.S. Army: Trained and Ready in an Era of Change." *Army* (October 1987), pp. 20-30.

Miscellaneous

History of the Tactical Air Command, Langley Air Force Base, Virginia, 1981, 1982, 1983, 1984.

Interview, Dr. Brooks Kleber with General Paul F. Gorman, 14 November 1974.

Morris, Rodler F. "A History of the Joint Readiness Training Center." Vol I: "Creating a Blueprint for the Original Institution, 1973-1987" (forthcoming). U.S. Army Combined Arms Center History Office, 1991.

TAC/TRADOC/ALFA AirLand Bulletins, Langley Air Force Base, Virginia: Headquarters, U.S. Air Force Tactical Air Command, 1978-1984.

INDEX

A-4 Skyhawk aircraft (USN), 15

Addabbo, Congressman Joseph P., 121

Afghanistan, 87

After action reviews, 1, 24, 45, 48, 57, 202-06, 112, 115, 126, 134

Air defense systems
  Chaparral, 69
  Stinger, 69
  Vulcan, 69
  ZSU-23-4 (Soviet VISMOD), 86

Air Force Systems Command, 137

Air Ground Engagement Simulation/Air Defense (AGES/AD), 69, 70, 136

Air liaison officers, 134, 147

Air Warrior (USAF)
  selection of name, 133
  Tactical Command Exercise Plan, 133

Aircraft, USAF
  A-7D, 131
  A-10, 131, 135, 137, 138, 147
  F-4D, 131
  F-16, 131

AirLand Battle doctrine, 129

Airspace Control Center (USAF), 134

Alexander, Secretary of the Army Clifford L., Jr., 17

American Expeditionary Force (AEF), 113

AMEX Systems, Corp., 60-62, 66, 68

Anniston Army Depot, 86

AR 350-2, *Opposing Force (OPFOR) Program*, 85

AR 350-50, *The National Training Center*, 34, 125, 127

Arab-Israeli Yom Kippur War (1973), 8-9, 10

Armor Center, 51

Armored warfare, effectiveness of, 8-9

Army 86, 54

Army Lessons Learned Integration Center, 126

Army Materiel Command (AMC), 9, 78

Army Materiel Development and Readiness Command (DARCOM), 9, 19, 22, 34, 86, 90

Army National Guard, 6, 28

Army Research Institute for the Behavioral and Social Sciences (ARI), 105-06
  Presidio of Monterey Field Unit, 115, 116

Army Science Board, 77

Army Tactical Data System, 14

Army Trainer magazine, 118-19

Army Training and Evaluation Program (ARTEP), 7-8, 10, 57, 87, 118, 123, 143

Army Training Program, 6-7

Army Training Study (1978), 21-22

Army Training Support Center, 118

Barstow, Calif., 28, 31

Base operations, 83

Battle Command Training Program, 146

Battle damage assessment, 135

Battlefield Operating Systems, 57-58, 101, 115, 118, 141

Blue Force
  2d Battalion, 34th Infantry, 108

Board for Dynamic Training, 7, 13

Boeing Services International, 43, 44, 53, 83-84

Bolger, Capt. Daniel P., 112-13
Bramlett, Brig. Gen. James T., 34, 37, 41-42, 48, 50
Brophy, Brig. Gen. Jeremiah, 37
Brown, Gen. Frederic J. xi, 21, 48, 103-04, 114-15, 120, 121, 136
Budgets. ***See*** Funding.

Caldera, Manuel R., 62
California Army National Guard, 31
California Assembly, 31
California Resources Agency, 31
Camp Irwin. ***See*** Fort Irwin.
Carson, Kit, 30
Carter, President Jimmy, 10, 41, 62
Cavazos, Gen. Richard E., 37, 83, 119, 141, 145
Center for Army Lessons Learned, establishment of, 126, 147
China Lake Naval Weapons Station, 28
Close air support, 129, 130, 132, 134, 147
Cochran, Maj. Gen. James F., 19, 21
Cole, Brig. Gen. Thomas F., 48, 49, 52, 55, 63, 78, 108, 122
Combat Arms Training Board ***See also*** Board for Dynamic Training. 7
Combat Analysis Laboratory, Rand Arroyo Center, 147
Combat Developments Command, 114
Combat Developments Experimentation Command, 60-61, 74, 77
Combat Maneuver Training Complex, 146
Combat Training Centers Master Plan, 146
Combined Arms Center, 16, 22, 49, 50, 51, 87, 105, 120, 123, 125, 127, 147
  reorganization, 52
  responsibility for lessons learned, 114-15
Combined Arms Combat Developments Activity, 52
Combined Arms Team Integrated Laser Engagement System (CATIES), 146
Combined Arms Training Activity, (CATA), 52, 115, 127, 147
Combined Arms Training Development Activity (CATRADA), 18, 24, 49, 50-51, 52, 57, 66, 73, 90, 101, 127
"Combined Arms Training Tips", 118
Command and control, 108-09
Command and General Staff College, 52, 115, 141
Communications. ***See*** Sound recording.
Communications systems, U.S. Army and USAF incompatibility, 135
Concept development and approval, 13-24
Continental Army Command (CONARC), 7
Contact management cell, 63
Conventional Forces in Europe (CFE) Treaty, 147-48
Core instrumentation subsystem. ***See*** Instrumentation system.
Corridors, training, 26, 84
Creech, Gen. Wilbur L. (USAF), 130, 137

Darling, Col. S. Price, 42, 48
Data analysis, 115-118, 123
Data Analysis Center, ARI, 147
Davis, Lt. Col. Phillip C., 132
Data collection. ***See also*** Instrumentation system; Lessons learned; Data analysis. 116-118, 124
Defense Advanced Research Projects Agency, 19, 60
Democratic Party platform (1976), 10
DePuy, Gen. William E., 7, 9-10, 13-14, 141
Desert environmental training concept, 19
Desert Shield - Desert Storm, xi, 147

Detachment 3, 4525th Combat Applications Squadron (redesignated Detachment 1, 831st Air Division) (USAF), 132
Development Plan, NTC, 19, 22-24, 102, 120
Division 86, 54
Divisions
2d Armored, 54, 74
8th Infantry, 19, 141
ROAD, 54

East Germany, replica of terrain, 16
EDAW, Inc., 31
Edwards Air Force Base, 28, 130
Edwards, Col. Richard I., 19, 30, 34
Eglin Air Force Base, 17
Electromagnetic Capabilities Analysis Center, 30
Environment concerns, 6
Environmental impact statement, 30-32
Evaluation of training, 6, 57-58, 90-98

F-4 Phantom jet (USN), 15
Field Artillery School, 78
FM 71-1, *The Tank and Mechanized Infantry Company Team*, 81
FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force*, 81-82, 119
FM 71-100, *Armored and Mechanized Division Operations*, 82
FM 100-5, *Operations* (1976), 2, 9-10, 11, 14, 85
FM 105-5, *Maneuver Control*, 85
Force-on-force, 90-98
Force modernization, 54
Forces Command, xi, 7n, 13, 18, 19, 22, 24, 31, 53-54, 61, 86, 102, 120, 121
and concept development, 13, 18-22
and environmental impact statement, 31
the question of responsibility, 33-37
Ford Aerospace and Communications Corp., 60-61
Ford, President Gerald, 62
Fort Benning, 7
Fort Carson, 14, 82
Fort Drum, 17, 21
Fort Hood, 14, 16, 73, 74, 78, 87, 117, 119
Fort Hunter Liggett, 60
Fort Irwin, 16-17, 19, 38
choice of, 25-32, 51, 53, 63, 82
reactivation of, 38-39, 41, 60
Fort Leavenworth, 18, 50, 119, 146
Fort Lewis, 14
Fort McPherson, 37, 122
Fort Monroe, 129
Fort Ord, 60
Fort Riley, 14
Fort Stewart, 17, 82
Forward air controllers (USAF), 133-34, 135, 147
Fremont, Capt. John C., 30
Funding, 37-41, 54, 112, 124

Gabriel, USAF Chief of Staff, Gen. Charles' A., 137
General Accounting Office investigation, 113, 123, 124
General Dynamics/Electronics, 60-61, 62, 66, 84
George Air Force Base, 26, 130, 131, 132-33
Germany, Federal Republic of, 18, 113
U.S. Army in, 8, 9,
Goldstone Space Tracking Station, 21, 29, 30, 68
Gorman, Maj. Gen. Paul F, xi, 5, 7, 10, 13-18, 22, 25, 28, 33, 81, 141
Grafenwoehr, Germany training center, 9

Granite Mountains. *See* Instrumention system.
Grenada intervention, 123, 125, 126
Griffiss Air Force Base, 17

Harrison, Maj. Gen. Benjamin L., 22
Heldstab, Brig. Gen. John C., 126
Helicopters
  AH-1 Cobra, 69, 70, 90
  AH-64 Apache, 69
  CH-47 Chinook, 69
  OH-58D Kiowa, 69
  UH-1 Huey, 69
  UH-60 Black Hawk, 69
Herndon, Lt. Col. Robert L., 36, 38
High Mobility Multipurpose Wheeled Vehicle (HUMMWV), 134, 147
Hohenfels, Federal Republic of Germany, 146
Human Resources Research Organization, 88

Indian Wars, 30
Indirect fire, problems with simulation, 75-79, 117, 143, 147
Infantry Center, 51
Instrumentation system, 1, 16, 18, 57-79, 105, 116
  design, 63-68
  maneuvers, 91-98
  prototype, 60
  upgrade, 146
Intelligence Center and School, 73, 90
Iran
  threat to Persian Gulf, 41
Irwin, Maj. Gen George Leroy, 30
Israeli Defense Forces (IDF), 18, 104, 111

Jenes Report. *See* Long Range Training Base Study.
Jet Propulsion Laboratory, 78
Joint Readiness Training Center (JRTC), 145-46

Kerwin, Gen. Walter, T., 17, 19, 21, 38
Korea, 15, 113
  U.S. forces in, 9
Korean War, 30
"Krasnovia", 82
Kroesen, Gen. Frederick, J., 20, 34

Langley Air Force Base, 129
Laser engagement. *See* Multiple Integrated Laser Engagement System
Laser engagement System (LES) (USAF), 130, 131, 135-38
Lawrence, Brig. Gen. Richard D., 21
Leach Lake Gunnery Range (USAF), 130
Leadership, importance of, 108-09
Lee, Maj. Gen. James M., 21
Leland, Brig. Gen. Edwin S. Jr., 106, 141
Lessons learned. *See also* Data analysis. 111-15
  dissemination of, 118-27
  in early 1900s, 113
  in 18th and 19th century, 113
  in the Korean War, 114
  in the Vietnam War, 114
  in World War II, 113-14
Lewis, U.S. Representative Jerry, 31
Lippencott, Col. John C., 19, 34, 41
Litton Corp., 15
Live fire exercises, 59, 98-101
  Air Force support for, 132
Live-Fire range, 18, 73-75
Logistics, 107
Logistics Center, 105
LOGPACS, 107
Long-Range Training Base Study, 22

Loral Electro-Optical Corp.
See Xerox Electro-Optic Corp.

M1 Abrams tank, 54, 98, 142
M2 Bradley Infantry Fighting Vehicle, 54, 98
M3 Bradley Cavalry Fighting Vehicle, 54, 98
M60 tank, 54
M113 armored personnel carrier, 54, 134
M551 Sheridan armored reconnaissance vehicle, 86
M548 tracked cargo carrier, 78
Mahaffey, Lt. Gen. Fred K., 113
Main battle tanks, Soviet T-72 (VISMOD), 86
Major units, 45
Maneuvers. *See* Force-on-force maneuvers.
Marsh, Secretary of the Army John O. Jr., 78, 124
Memoranda of understanding (or agreement) (USA-USAF)
1 Dec 1981, 130, 131
22 May 1984, 134
METT-T (mission, enemy, terrain, troops, and time available), 101
Mexican War, 30
Meyer, Gen. Edward C., 14, 17, 19, 34, 37, 141
Military Personnel Center, 49-51
Missiles, antitank, 70
Dragon, 66, 69, 74
LAW, 98
SAU-122-mm. (Soviet VISMOD), 86
TOW, 66, 69, 70, 74, 97, 98
Mobilization model of training, 6
Mojave Anti-Aircraft Gunnery Range. *See* Fort Irwin.
Mormon Battalion, 30
Motor pool. ***See also*** Pre-positioned equipment. 83
Motorized rifle regiment. *See* Opposing forces.
Movement to contact maneuvers, 96-98
MRC 107/108 jeep, 134
Multiple Integrated Laser Engagement System (MILES), 1, 16, 60, 63, 68-71, 75, 77, 84, 93, 97, 98, 116, 131, 146, 147
Multiple Launch Rocket System, 54

National Aeronautics and Space Administration (NASA), 21, 30
Naval Fighter Weapons School, 15, 85
Nellis Air Force Base, Nev., 15, 16, 17, 19, 26, 27
New England Army installations, 10
New Jersey Army installations, 10
New York Army installations, 10
Night vision goggles, 135
Norton Air Force Base, 83
NTC Feedback System, 123, 125
NTC Future Concept, 145, 146
"NTC Observations", 115, 121-22, 123-24
Nuclear, biological, and chemical warfare, simulation of, 147

OAO Corp., 60
Observer-controllers. ***See also*** Force-on-force maneuvers; Live-fire exercises; After action reviews. 1, 24, 71-73, 81-82, 84, 117, 119, 123, 135
Obstacle breaching, 108
"Operation Red Flag", 15, 85
Operations Group, TRADOC, 23, 24
OPFOR Units
1st Battalion, 73d Armor, 86
6th Battalion, 31st Infantry, 86
Opposing force (OPFOR), 23, 34, 44, 85-90, 91, 116
evaluation of, 90

scenarios, 88
studies, 88
training, 87-88, 119
uniforms, 87
for USAF Operation Red Flag, 15-16
Opposing Force Training Detachment, 119
Organization of the National Training Center 35, 41-55
Otis, Gen. Glenn K., 37, 51, 141

Panama, 113
Paschall, Col. Rod, 111
Patterson, Secretary of War Robert P., 13
Patton, Gen. George, S., 30
Pershing, Gen. John J., 113
Personnel turnover, effects of, 112-13
Position location, 66
Precommand Course, 119
Prepositioned equipment, 23, 83-84
Program analysis and resource reviews, 19
Program Objective Memorandum, 21
Program review organization (USAF), 130, 133
Public Law 95-507. *See* Small Business Administration.

Range Data Measurement Subsystem. *See* Instrumentation system.
Range Monitoring and Control Subsystem. *See* instrumentation system.
Reagan, President Ronald, 41
Reconnaissance, 107
Red Banner, 17, 22
"Red Thrust". *See also* Opposing force. 119
Reed, Maj. Gen. Robert H. (USAF), 136
Review of Education and Training for Officers (RETO), 22
Reorganization Objective, Army Divisions. *See* Divisions, ROAD.
Richardson, Gen. William R, xi, 37, 50, 51, 52, 63, 102, 106, 124, 137, 141, 142, 145
Rogers, Gen. Bernard W., 13-14, 17, 21, 40, 142
Rosenblum, Maj. Gen. Donald E., 37
Ross, Lt. Gen. Marion C., 37

Sacramento District Engineer, 31
Saint, Maj. Gen. Crosbie E., 121
San Bernardino Sun, 122
Scenario development, 44, 51, 82
Science Applications, Inc., 60-61, 62
Sculley, Assistant Secretary of the Army Jay R., 78
Secretary of Defense, Office of, 30
Seigle, Maj. Gen. John W., 19
Selective Service System, 6
Senior Leader Training Program, 119
Sennewald, Gen. Robert W., 141
Shackelford, Col. William L., xi, 47, 48-49, 51, 52, 55, 62, 73
Shilo training area, (Canada), 18
Shoemaker, Gen. Robert M., 34, 141
Shoulder weapons
AK-47 rifle, 87
M16 rifle, 70, 75, 98
Simulation of Area Weapons Effects (SAWE), 78-79
Simulation of Area Weapons Effects-Radio Frequency, 146-47
Sinai/Negev, Israel, 18
Site selection, 25-32
Small Business Administration, 60
Smith, Maj. Gen. James C., 31, 34, 37
Soldier Support Center, 51
Sound recordings, 68, 95, 115

Soviet Union
arms buildup, 8
Army organization, 86
doctrine, 16, 87
in FM 100-5, 85
forces in Germany, 18
military training manuals, 87
MTLB personnel carrier, 86
tactics, 15-16
weapons advantage, 10
wheeled vehicles, (VISMOD), 86

Spanish Trail, 30

Spectrum analysis, 68

Staff, 43

"Star Wars" building. *See* TRADOC Operations Center.

Starry, Gen. Donn A., 19, 21, 22, 34, 50, 60, 130, 141

Stennis, Sen. John C., 40

Stone, Lt. Gen. Howard, 48, 51

Subject matter experts, 119, 123

Suffield training area (Canada), 18

Tactical air control parties (USAF), 134, 147

Tactical Air Support Center (USAF), 131

Tactical Engagement simulation. *See also* Multiple Integrated Laser Engagement System. 13, 14

Tactical Operations Center (USAF), 134

Take home packages, 1, 24, 57, 105-06, 112, 115, 118, 123, 124

Thompson, Col. R. H. (USMC), 89

Thurman, Maj. Gen. Maxwell, R., 21, 37

Tiefort Mountain. *See* Instrumentation system.

"Top Gun". *See* Naval Fighter Weapons School.

TRADOC Combined Arms Test Activity, 73-74, 75

TRADOC Operations Center. *See also* TRADOC Operations Group. 63, 91-95, 102, 105, 146

TRADOC Operations Group. *See also* TRADOC Operations Center. 34, 72, 81, 82, 91-95, 96-97, 106
organization, 43-47
staffing, 49-51

TRADOC Regulation 11-7, Operational Concepts and Army Doctrine, 120

TRADOC Systems Manager, NTC, 78

Training Developments Directorate, 18

Twelfth Air Force, 131

Twenty-nine Palms Marine Base, Calif., 25, 31

U.S. Air Force, 1, 30, 85, 97, 98, 129-39, 141, 147
Military Airlift Command, 133
Operation Red Flag, 15, 16, 19, 129, 130
64th Fighter Weapons Squadron, 15-16
Strategic Air Command, 133
Tactical Air Command, 15, 129-39
Tactical Fighter Weapons Center, 15

U.S. Army, Europe, 8

U.S. Army Reserve, 6

U.S. Congress, 31-32, 124, 125

U.S. Corps of Topographical Engineers, 30

U.S. House of Representatives, Defense Subcommittee of Appropri ations Committee, 31, 32

U.S. Marine Corps, 88-89

U.S. Navy Fighter Weapons School ("Top Gun"), 15, 30, 85

Unit Training Directorate (CATRADA), 18

United Kingdom, 18

Video recordings, 24, 68, 93-95, 115

Vietnam War, 6-7, 8, 10, 15, 30
post Vietnam training, 101

Visual modification kits, 34, 86
Vuono, Gen. Carl E., 1, 122, 124, 141

Wagner, Brig. Gen. Lewis, E., 20n, 21
Warsaw Pact, 5, 85
  doctrine, 1, 86, 88
  size of force, 8, 86
  strategy, 1
  tactics, 1, 86, 88
  threat, 87
Weapons
  lethality of modern, 14-15
Weapons engagement subsystem, 66-68
Weigley, Russell F., 6-7, 9
Weiss, Herbert K., 15
Westmoreland, Gen. William C., 7n
Wickham, Chief of Staff Gen. John A. Jr., 83, 125-26, 137, 141, 142, 144, 145
Wissinger, Lt. Col. Allen R., 25
Word, Col. Larry E., 66, 72, 103, 104, 116
World War I, 14
World War II, 14, 15, 30
Wray, Maj. Gen. William R., 20, 34

Xerox Electro-Optical Systems (later Loral), 60-61, 68, 78, 86, 137-38

Yuma Proving Ground, Ariz., 25, 31